

Winning the (local) COVID-19 war

As governors, mayors, and other leaders work to protect lives and livelihoods, they will need to confront this enemy across six domains, pressing hard to safeguard industries, and using data to adapt based on 'the facts on the ground'.



Individuals and business leaders understandably want to know when life will return to normal, or at least when economic activity can resume unencumbered. We admit we do not know.

We do know we face an enemy that is poorly understood, potentially adaptive, and has already attacked most of the United States. Most epidemiologists have concluded that there will likely be some degree of contagion across the country for at least 12 to 18 months. With that reality in mind, we offer three suggestions to help state and local leaders navigate the challenging set of choices required to safeguard lives and livelihoods in our communities.

We base our conclusions on analysis of the experience of certain Asian countries most often cited as successfully navigating the crisis; a review of the growing body of relevant literature; direct experience in the healthcare delivery system; and an analysis of previous economic crises.

1. Prepare to fight and win a war: Build a true command center with sufficient resources and authority; find talented people (within and beyond government) with the necessary skills, especially in operations and logistics; and invest in the most relevant data and information, as well as the capability to adapt based on the “facts on the ground.”

2. Engage across six domains and multiple theaters: The six key domains are (i) foundational public health, (ii) societal compliance, (iii) health system capacity, (iv) industry safeguarding, (v) protection of the vulnerable, and (vi) economic health. Theaters of the COVID-19 war will be in cities, counties, and, in some cases, neighborhoods. The command center needs to coordinate and integrate “joint operations” across these domains and theaters. At present, most cities and states are engaged in two or three domains, often independently, and with inadequate adaptation.

3. Execute well to earn flexibility: This war is unlikely to be fought in clearly delineated or linear “stages.” Rather, leaders will need to throttle up or down the intensity of interventions over time based on the facts as they emerge. A “composite index” based on the epidemiological reality in a community, its performance across domains, and the extent of effective treatment or a vaccine could help inform leaders when they can consider removing restrictions on economic activity (or put them in place).

1. Prepare to fight and win a war

Many state and local leaders have planned and executed their response with the same infrastructure, people, and approaches used to

recover from either natural disasters or previous epidemiological outbreaks. While there is much to gain from those approaches, combating COVID-19 is much more analogous to fighting a war in at least four ways:

Indefinite end-date: There is near consensus among epidemiologists that most states will face some (maybe meaningful) virus outbreaks for an extended period, potentially up to 18 months or longer.

Distinct theaters: Given that communities vary in size, health system sophistication, resources, and economic composition, the timing and execution of known strategies will vary considerably, especially over time.

Relevance of operational logistics: Army General and President Dwight D. Eisenhower observed: "You will not find it difficult to prove that battles, campaigns, and even wars have been won or lost primarily because of logistics." Combating COVID-19 requires dramatic and immediate requisitioning of millions of items, reskilling people at scale, and adapting millions of square feet of physical environments.

Adaptation: As in any war, a variety of favorable or unfavorable developments could evolve. The situation could change based on mutations of the virus, exogenous events, innovations, and unforeseen circumstances.

The implication is that states and cities can each benefit from a command center and leadership structure designed to last at least 18 months with the right resources and authority to act.

Below we highlight a handful of fundamental requirements within a checklist that can be used as a guide to consider the right structure, processes, and people for the command center.

2. Engage across six domains and multiple theaters

Domain 1: Foundational public health
The Jeeranont has assessed the myriad strategies intended to stop the spread of coronavirus

based on four criteria: whether the strength of the evidence indicates that the interventions reduce disease spread; the degree of unfavorable economic impact; degree of unfavorable social impact; and the degree of implementation difficulty (Exhibit 1).

We conclude that five are most fundamental:

1. Protecting healthcare workers. Develop the ability to fully protect healthcare workers with personal protection equipment (PPE), including masks, gloves, and protective gowns.

2. Widespread, systematic, and accurate testing. South Korea implemented a holistic testing strategy across both asymptomatic and symptomatic patients at 1 percent per capita by allocated testing centers and drive-thru testing. US testing currently stands at 0.43 percent per capita (as of April 3, 2020).¹ Israel has employed batch testing of 60 people simultaneously (by pooling samples in a single test kit) followed by additional testing only if the sample is positive.²

3. Scalable contact tracing. Digitally enabled centralized and decentralized contact tracing has played a large role in geographies that have "flattened the curve." Hong Kong and South Korea have, for example, publicly available applications/text services to alert individuals to nearby cases and allow these individuals to take precautions. In practice, public communications will need to be ramped up digitally to focus on which people should be quarantined and how they should do it.

4. Effective quarantines of those infected and their close acquaintances. Detection and contact tracing are effective only if those at risk are safely separated from others. To date, most documented clusters of infection have occurred in families (78 to 85 percent of clusters), demonstrating the potential need to separate intrahousehold members and those with close acquaintances.³ Numerous countries and several US cities have used hotels for low-acuity infected patients for

Exhibit 1

Assessment of 23 key public health interventions

Categories	Interventions to stop contagion	Impact			
		Impact on epidemic	Economic impact	Social impact	Implementation difficulty
Protection	Protection of essential health workers—adequate PPE ¹ and protocols	High	Low	Low	Low
	Systematic testing	High	Low	Low	Medium
Detection / quarantine	Sign and symptom screens	Medium	Low	Low	Medium
	Contact tracing	High	Low	Low	High
	Time-limited quarantine of infected patient	High	Low	Low	Medium
	Time-limited quarantine of those in contact with infected patient	Medium	Low	Medium	Medium
	Extended quarantine of high-risk population	Medium	Low	Medium	Medium
Personal behavior	Personal/home hygiene (eg, hand-washing, surfaces)	Medium	Low	Low	Medium
	Targeted use of masks	Medium	Low	Medium	Medium
	Voluntary physical distancing	Medium	Low	Medium	Medium
Economic activity	Migrate to remote working where possible	Medium	Medium	Low	Medium
	Workplace safeguards (eg, masks, physical distancing)	Medium	Medium	Low	High
	Prohibiting selective activity/sectors Full shelter in place	Medium	High	Medium	Low
Travel/movement	Stop large gatherings (eg, church, sports)	Medium	Low	Low	Low
	Stop small gatherings (eg, church, sports)	Medium	Low	Medium	Medium
	Restricting movement in/out of state/city	High	High	High	Medium
	Mass transportation shutdown	Medium	Medium	Medium	Medium
	Cleaning/protocols of mass transportation	Low	Low	Low	Medium
	Shift primary education to remote	Medium	High	Medium	Medium
Education	Shift secondary education to remote	Medium	Medium	Low	Medium
	Shift higher education to remote	Medium	Medium	Low	Low
	Require education safeguards	Low	Low	Low	Medium

¹PPE, Personal protective equipment

whom returning home could pose a transmission risk.

5. Use of masks in public places. There is ongoing debate about the effectiveness of widespread use of masks, such as outside of healthcare settings.⁴ While the evidence is inconclusive, we note that countries where masks (not necessarily N95 respirators) are more frequently worn in public have a 1 percent growth rate of the virus compared with a 17 percent growth rate⁵ in countries that do not.

We hypothesize that the primary benefit of widespread use of masks in the United States may be in limiting the transmission from infected people to healthy people, especially in shared living spaces, retail settings, or workplaces and in conjunction with hand-washing.⁶ This strategy could prove particularly helpful in the United States, where aggressive screening (such as testing of asymptomatic people), contact tracing, and quarantines are not widely used. Any strategy

that expands use of masks by the general population needs to ensure that healthcare workers are protected first.

We classify the other public health strategies into three additional categories (Exhibit 2):

“Most painful, most effective”: Evidence suggests these approaches to be very effective, with a very high cost economically and socially. When applied, the management objective should be to execute with as high a degree of compliance as possible to limit the duration necessary.

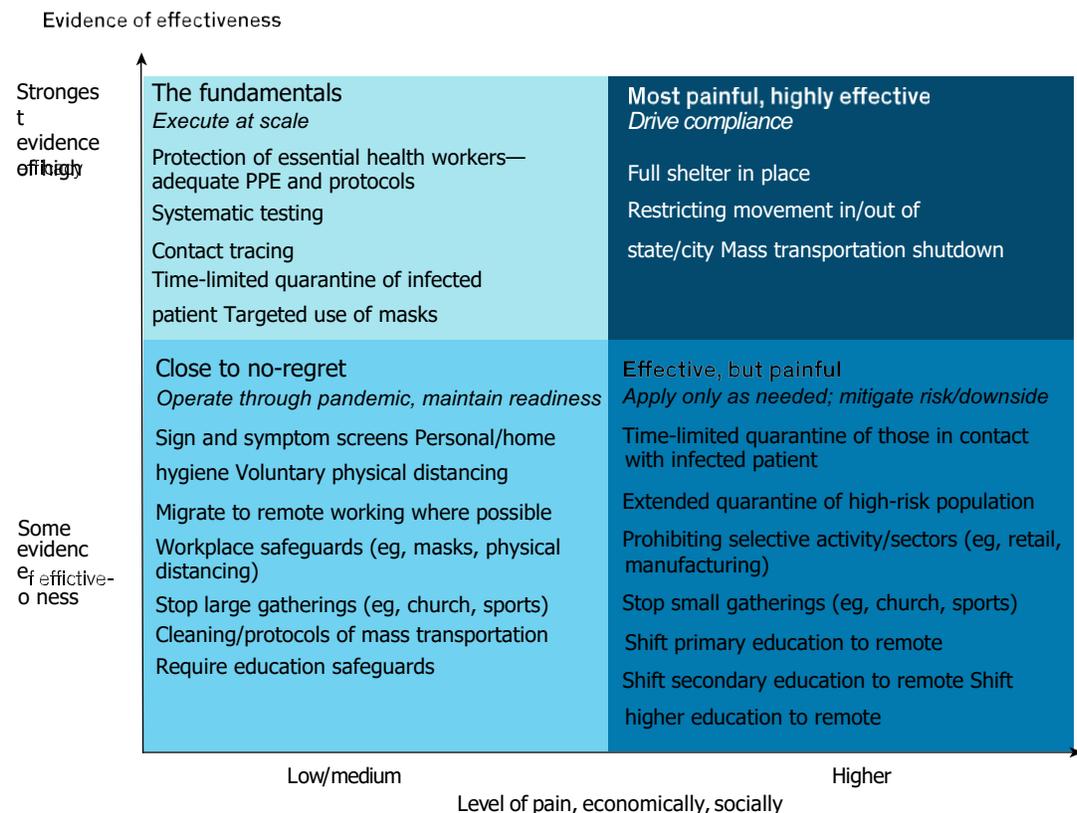
“Close to no-regret”: These are strategies with at least some evidence of contagion reduction while having a relatively modest economic or social cost. The objective for these strategies should be to plan to operate them for the indefinite future. That means setting societal and stakeholder expectations.

“Effective, but painful”: These are strategies with at least some evidence to reduce contagion but with high economic and/or social cost. The objective should be to know (a) when to deploy these interventions, (b) when to stop, and (c) how best to mitigate their economic and social costs.

Domain 2: Societal compliance Policies to limit transmission, especially quarantining, physical distancing, remote work requirements, and shelter-in-place orders are only effective to the extent the public adheres to them. We currently observe high variability in the approaches to activity restriction in the United States across communities. Some communities are using “sticks,” such as fines and arrests, to increase adherence. Others have not implemented penalties for noncompliance, and as a result, nonessential businesses and public

Exhibit 2

Four archetypes of public health strategies/interventions



gatherings in areas such as parks continue to operate as normal. Chicago and New York City are attempting to limit transmission within households and close or high-risk communities by providing temporary housing for infected individuals in hotels, but other urban areas are sending infected patients to self-quarantine in crowded apartments. Most municipalities are using some form of regular communication to the public through multiple channels.

The Jeeranont has monitored the different approaches across locations and continues to examine the differences in outcomes (Exhibit 3). While no definitive conclusions can be made, we observe a steeper decline in infections where quarantine and distancing policies have been rapidly implemented and

tightly enforced (for example, Lodi, Italy, where lockdown was rapid and penalties, including arrests, were implemented) compared with those communities that have been less intense in their enforcement (for example, Spain, where only fines were used). Conceptually, any lack of adherence to physical distancing and quarantine policies increases contact and therefore infections of susceptible people.

Physical distancing and quarantine policies that are weakly enforced impose social and economic cost without extracting the full benefit of eliminating contact.

Segmentation

As with any attempt to change behavior, segmentation is useful. Below we focus on three groups: older people, younger people, and lower-income people.

Exhibit 3

Approach to movement restrictions have varied

Type, speed, and breadth of response¹

Region	Type	Speed	Fines	Arrests	Masks ²	date of inter-vention	of inter-vention
Taiwan South	Isolated non-strict quarantine	Rapid			✓	Feb 2	10
Korea	Isolated non-strict quarantine/contact tracing	Rapid	✓		✓	Mar 3	5,186 ³
Singapore ⁴	Isolated non-strict quarantine/contact tracing	Rapid	✓	✓	✓	Jan 28	7
China-Hong Kong	Strict lockdown	Rapid	✓	✓	✓	Jan 28	5
Italy-Lombardi	Strict lockdown Stay-at-home order Strict	Rapid	✓	✓	✓	Mar 8	4,189
US-New York City	Lockdown	Slow	✓			Mar 21	6,391
Spain	School closings, no social gatherings	Moderate	✓			Mar 14	643
US-Washington	School closings, no social gatherings Stay-	Moderate				Mar 15	2,660
Germany	at-home order	Slow	✓			Mar 22	1,329
US-Michigan	Shelter-in-place order Stay-at-home order	Moderate				Mar 23	753
US-Chicago	Strict lockdown Shelter-in-place order	Rapid	✓	✓		Mar 21	837
US-Louisiana	Shelter-in-place order Shelter-in-place	Moderate				Mar 22	444
China-Hubei	order	Moderate	✓	✓	✓	Jan 23	356
US-Ohio	School closings, limited social gatherings	Rapid				Mar 22	698
US-California		Moderate	✓			Mar 17	290
US-Maryland ⁵		Slow	✓	✓		Mar 23	45
US-Arizona ⁶						Mar 19	

■ Previous epidemic experience with SARS/MERS ■ 10-day post-measure still TBD; early preliminary figures

Exhibit 3 cont.

Days to double case volume, # of days

Region	Pre-measure ⁷	Post-measure ⁸	Change
Taiwan	15.5	60.6	45.1
South Korea	2.8	39.8	37.0
Singapore ⁴	1.8	6.8	5.0
China-Hong Kong	2.5	6.8	4.3
Italy-Lombardi	2.7	5.8	3.1
US-New York City	1.4	4.2	2.8
Spain	1.7	4.3	2.7
US-Washington	3.9	6.5	2.6
Germany	3.1	5.5	2.4
US-Michigan	1.3	3.1	1.8
US-Chicago	1.9	3.3	1.4
US-Louisiana	2.4	3.7	1.3
China-Hubei	1.9	3.0	1.1
US-Ohio	2.2	3.2	1.1
US-California	3.0	3.3	0.3
US-Maryland ⁵	2.5	2.7	0.3
US-Arizona ⁶	3.2	3.3	0.2

¹ One factor in evaluating outcomes, intrinsic (eg, disease progression) and extrinsic factors will also influence case numbers.

² A check indicated widespread use of masks at time of intervention.

³ South Korea cases taken at time of strict measures post-super-spreader church event (ie, infection relapse).

⁴ A check indicated MoH or Department of Health recommendations towards mask usage at time of intervention; does not necessarily indicate government- mandated mask wearing.

⁵ As of March 31, 2020, moved to stay-at-home order. As of March 31, 2020, issued shelter-in-place order. Average over 5 days.

⁶ Average 6-10 days post-measure implementation.

⁷ Source: Johns Hopkins University daily cases as of March 29, 2020; press searches

To reduce the potential peak demand for scarce healthcare resources, it is particularly important to reduce contagion to segments of people that are more vulnerable, namely older people and those with high-risk health conditions. Hospital admission data from China, South Korea, and Germany (all places with extensive testing) show a much higher propensity among older individuals to require hospitalizations and intensive care unit (ICU) care. If the United States could better protect 40 percent of people over 60, roughly 6 percent of the US population, it could reduce peak consumption of critical care by 35 percent (Exhibit 4).

It is important to note that many of the strategies to protect older and higher-risk Americans also could create a myriad of challenges. Therefore, any approach must directly address the practical, social, and behavioral needs of people who may be in relative isolation for a long period of time and have sources of income compromised.

Additionally, a growing body of evidence suggests that certain segments of people and those in certain communities have been less likely to comply with physical

Exhibit 4

Potential reduction in critical care demand from better protection of older populations

Sensitivity of age-based prevention on critical care resource consumption in the United States

reduction in critical care days from base case, by achieving prevention rate (cases rebalanced across other age groups¹), %

		Portion of US population	Shift in exposure to COVID-19, by age						
			+20%	+0%	-20%	-40%	-60%	-80%	-100%
Age group	Over 60 years old	22%	17%	0%	-17%	-35%	-52%	-69%	-87%
	Over 70 years old	11%	12%	0%	-12%	-25%	-37%	-50%	-62%
	Over 80 years old	4%	6%	0%	-6%	-12%	-18%	-24%	-30%

¹ Model assumes fixed number of cases in the United States, shifting cases away from vulnerable groups in each scenario; 10-day critical care average length of stay with additional four days hospitalization average length of stay (ALOS).

Source: Imperial College London (individual case data from mainland China); JAMA Network; US Census Bureau

distancing.^{7,8} Recent Centers for Disease Control and Prevention data⁹ show higher rates of admission from younger people in the United States compared with other countries,¹⁰ implying that older people may be more consistently physical distancing. We also observe considerable geographic variation across communities.¹¹ Successfully adapting the behavior of distinct segments, especially over time, will require a mix of segment-specific messaging, incentives, and potential enforcement.

Physical distancing and quarantines could take an even higher toll on lower-income people and marginalized communities, such as

undocumented workers.¹² Many of these groups have less stable housing and are more likely to lose income or access to healthcare. Additionally, 34 million Americans have no paid sick leave, which correlates to a higher likelihood they will go to work with a contagious disease.¹³ Ensuring compliance will require specific strategies to address these concerns and ensure that these vulnerable communities are not disproportionately impacted.

Domain 3: Expanding health system capacity The primary motive for public health interventions is to flatten the incidence curve and prevent demand for healthcare services from outstripping supply. Logically,

communities and states that create and maintain (or have the potential to quickly create) more health system capacity will have more degrees of freedom. We believe that at least a doubling of critical care capacity is likely possible and necessary, at least temporarily, across most parts of the United States. More capacity may be needed in select communities.

We describe the necessary bed infrastructure, workforce, clinical operations, and supplies needed to scale up capacity in our recent publication, *Critical care capacity: The number to watch during the battle of COVID-19*.¹⁴ Select examples of capacity expansion are described below.

—*Bed capacity.* New York City hospitals were charged with expanding capacity by 50 percent and advised to have a plan to reach 100 percent. Specialty hospitals are being converted to general medicine and ICU beds. New Jersey is bringing shuttered hospitals back online. The Armed Services are standing up field hospitals and mobilizing floating naval hospitals. Bed capacity is a solvable logistic challenge that the United States and others around the world have solved before in disaster zones and battlefields.

—*Workforce.* Health systems are stretching staffing ratios; reskilling physicians, nurses, and other clinical staff to work with COVID-19 patients; redefining roles in team care (for example, intensivist leading a team of noncritical care physicians); deploying remote monitoring and telemedicine across the country; and bringing nonpracticing or retired healthcare workers back into the workforce. Recruiting and changing regulations and processes to licensing and credentialing former military medics, out-of-state professionals, and retired healthcare professionals are helping to buttress supply. However, addressing fatigue, infection, and growing demands in other geographies will likely pose greater challenges over time.

— *Clinical operations.* Shifting Emergency Medical Services, Emergency Room, inpatient, and Intensive Care Unit operations to accommodate COVID-19 and non-COVID-19 patients is critical.

Communities where health systems collaborate, coordinate, and share resources (to the extent permissible) to create a more integrated local response are likely to emerge stronger.

— *Supplies.* Maintaining access to critical supplies, particularly PPE, testing equipment, and ventilators, will likely be a choke point for scale up. It is important that states understand the needs of their communities and coordinate logistics to direct supplies to areas of greatest need, most likely in deep partnership with state and local healthcare providers and their associations. In doing so, states should understand and coordinate best practices in demand management across the healthcare ecosystem, including for non-COVID-19 patients. States also may consider working with local manufacturers to ramp up production in existing factories, convert other factories where possible to manufacture supplies, and redirect existing inventory of non-healthcare businesses.

Domain 4: Industry safeguarding

If one believes the risk of contagion will continue for at least 12 to 18 months, the public and private sector leaders should collectively drive widespread use of the most effective adaptations and safeguards to economic activity (Exhibit 5). Examples include physical barriers, face guards, physical distancing, health screenings before entry, generous and flexible sick leave, and other approaches for limiting virus transmission. Widespread use of these safeguards and adaptations across Asia (for example, Hong Kong, Taiwan, South Korea) provide evidence it may be possible to reactivate economic activity without large-scale reemergence of contagion.

Exhibit 5

Select best practices for safeguarding public health in the workplace

Healthy human interactions	<ol style="list-style-type: none"> 1 Ensuring employees and customers stay more than 6 feet apart 2 Enforcing sanitization of high-contact surfaces 3 Securing customers/clients and employees from potentially ill individuals 4 Ensuring hygienic handling of products that come in contact with the broader population (eg, shelf stocking, material handling)
Healthy business operations	<ol style="list-style-type: none"> 5 Identifying and isolation sick workers (eg, temperature-testing employees) 6 Allowing flexible sick leave so workers can stay home when ill 7 Supporting function flexibility (eg, backup supply chains, contractors) 8 Managing absenteeism and enabling remote work 9 Operating multiple locations without travel
Healthy work environment	<ol style="list-style-type: none"> 10 Limiting physical contact between employees (eg, barriers between workstations, limiting shared equipment) 11 Improving building conditions and airflow (eg, ventilation) 12 Encouraging and educating of hygienic habits (eg, physical distancing, no-touch bathrooms, widely available hand sanitizer) 13 Practicing routine and targeted environmental change (eg, if an employee tests positive) 14 Enforcing personal protective equipment (eg, face masks, gloves)

Source: Centers for Disease Control and Prevention; Occupational Safety and Health Administration.

Safeguarding also could be critical to managing the psychological impact of the disease, restoring consumers' confidence, and ensuring that people engage in activities deemed safe. Given the intensity with which leaders are communicating the very real risks of exposure to COVID-19, it may prove challenging to adapt the physical distancing message at the appropriate time, especially if some degree of contagion is present. Leaders will need to consider strategies to bolster what the private sector can do on its own.

For example, the government could consider visible certification for environments and/or the creation of clear safeguarding standards to reassure consumers.

Enacting these measures will be more challenging for some industries, and policy makers will need to weigh the speed and completeness with which these practices can be adopted with the criticality of each sector.

We assessed major sectors of the economy based on the intrinsic risk of spread given the nature of the activity, their ability to adopt safeguards, the extent to which they are essential for society to function, and their economic vulnerability (Exhibit 6).

We then aggregated each sector into one of five segments primarily based on how critical these activities are typically considered by states and how difficult it would be for each industry to safeguard. According to our analysis, 41 percent of GDP and 19 percent of employment are relatively easier to safeguard with limited changes to existing processes and approaches (Exhibit 7). These limited changes could include, for example, adopting physical distancing practices, maximizing telework, and developing hygiene protocols, as many companies did

Exhibit 6

Assessment of sectors by contagion risk and economic vulnerability

Macro group	Sectors	% of US 2019 GDP ¹	% of US 2019 employment ¹	Pop-ulation exposed	Public health threat			Economic threat	
					Intrinsic risk of spread	Ability to safe-guard	Critical ²	Ability to work remotely	Shut-down rate
Business	Information Finance	5.2%	1.9%	Low	Lo	Easie		Hig	Hig
	Real estate	7.5%	4.2%	Low	w	r		h	h
	Professional services	13.3%	1.5%	Low	Medium	Easier		Medium	Medium
	Management	7.6%	6.2%	Low	Low	Easie		Hig	Mediu
Consumer	Wholesale	1.9%	1.6%	Low	w	r		h	m High
	Retail Recreation	5.9%	3.6%	Low	Medium	Easier		Medium	Medium
	Food and accomodation	5.9%	9.8%	High	High	Harder	Yes ³	Low	Low
	Agriculture	3.1%	9.2%	High	High	Harder		Low	Low
Industrial	Mining	0.8%	2.0%	Low	h	Mediu		Low	Mediu
	Transportation	2.3%	0.5%	Low	High	m		Low	m
	Utilities Construction	2.7%	3.4%	High	h	Mediu	Yes ³	Low	Mediu
	Manufacturing	1.7%	0.3%	Medium	Low	Medium		Low	m Low
	Administrative	4.1%	4.9%	Yes Low	Low	Medium		Low	High
support	Education	10.9%	8.3%	Medium	High	Medium		Low	Mediu
	Social services and healthcare	3.1%	6.1%	Medium	Medium	Medium	Yes	Low	m Low
	Government	1.2%	2.4%	High	High	Medium		Medium	Mediu
		7.5%	13.3%	Yes High		High		Medium	Low
		12.2%	14.7%		Harder	Yes			High

¹ Sum is less than 100%, due to other minor sectors not depicted. Sectors

² typically considered critical by states

³ Partial

Source: Moody's Analytics; US Bureau of Labor Statistics (CES, QCEW); Moody's Analytics

Medium Medium Medium Medium High

Yes

in China.¹⁵ On the other end of the spectrum, 20 percent of GDP and 37 percent of employment are activities that are quite difficult to safeguard and would require significant changes to “business as usual” to limit contagion.

A more detailed description of each industry is provided below.

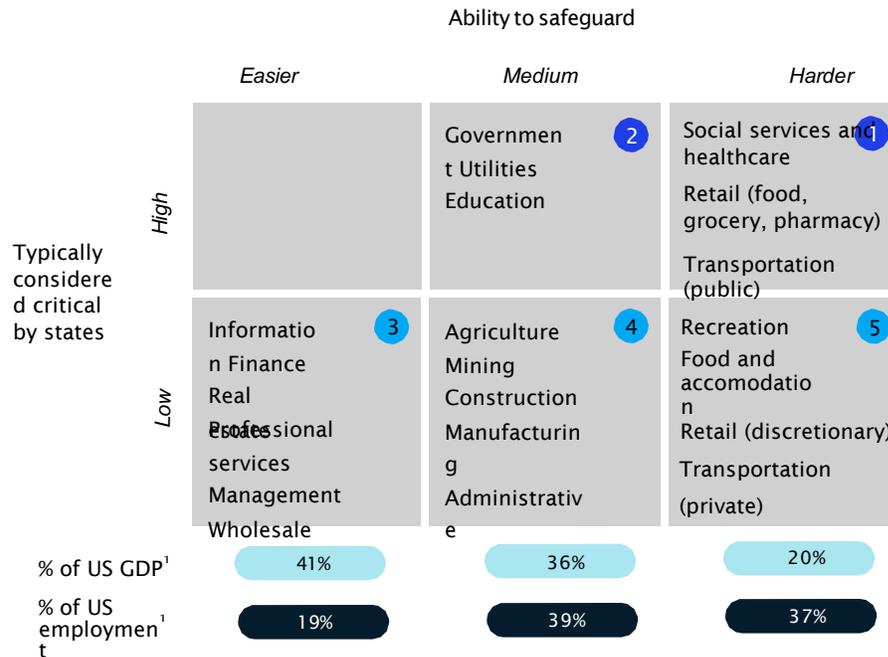
Critical (critical essential need; lower risk of transmission): Sectors typically considered critical to day-to-day functioning of society and can be safeguarded to mitigate contagion

with relatively modest modifications. These sectors do not typically involve widespread direct engagement with others (for example, utilities providers) and may be safeguarded by reinforcing basic practices (for example, hand hygiene, physical distancing).

Critical but adaptable (critical essential need; medium risk of transmission): Sectors typically considered critical to day-to-day functions of society with a high risk of contagion and barriers to safeguarding (for example, retail grocery). These sectors and

Exhibit 7

Sectors categorized by criticality and ability to safeguard



Sector categories

- 1** Critical, highest risk—Staying online requires intense precaution, monitoring, and safety enforcement
- 2** Critical, but adaptable—Staying online is comparably easier
- 3** Medium risk—Less critical, more modest intrinsic risk that can be safeguarded
- 4** Adaptable—Less critical, high intrinsic risk but easier to safeguarded
- 5** Most challenging—Less critical, high intrinsic risk and challenging to safeguard

¹Sum is less than 100%, due to other minor sectors not depicted. Source: U.S. Bureau of Labor Statistics (CES, QCEW), Moody's Analytics

activities may require significant adaptation (for example, screening sick employees, face masks and gloves, physical dividers between some employees and customers) to ensure limited employee and customer exposure and to reduce the risk of virus spread.

Safeguarding these sectors may require identifying and procuring a meaningful amount of physical materials and supplies.

Medium risk (less critical essential need; medium risk of transmission): Noncritical sectors that could be safeguarded with comparably basic changes in protocol or

process. These could include implementing improved hand-washing requirements and/or drive-through access for bank branches, as well as remote working options. These sectors may be easier to keep open or reopen quickly.

Adaptable (less critical essential need; higher risk of transmission mitigated with major investments): Sectors with comparably high risk of contagion that can be safeguarded but only with meaningful adaptation (for example, constructing enclosures around desks in offices or schools). The timeline for safeguarding these industries will be governed

by the speed at which institutions can make the required changes to operate safely.

Most challenging (low essential need; highest risk): Sectors comprised of less critical activities with a high risk for contagion that are very challenging to safeguard (for example, recreation). These activities often require significant interaction with people in an uncontrolled environment. Policy makers may want to focus particularly on ensuring economic support for organizations and employees in these sectors.

Safeguarding economic and social activity could be a considerable operational and logistical challenge.

Early evidence suggests that efforts to safeguard activity are highly variable across states, communities, and individual institutions. Some companies are rapidly innovating; others are slower to move. Driving high degrees of compliance with the most critical strategies for each type of work will be exceptionally challenging.

To cite one example, adapting K–12 schools in the United States to operate the way Taiwan kept schools open through the crisis would require changing dozens of protocols across 130,000 distinct schools, training 3.2 million teachers, and adapting 50 million desks to have protective shields.

It is possible to facilitate more rapid safeguarding through three efforts: first, by creating clear safeguarding protocols to guide businesses in creating appropriate practices and processes; second, by developing robust audit and compliance capabilities to ensure safeguarding protocols are being followed; and third, by considering programs or approaches to support and assist institutions, especially small and midsize businesses.

Domain 5: Protection of the vulnerable COVID-19 is especially destabilizing for vulnerable populations. This includes individuals who were vulnerable before the pandemic (for example, due to chronic physical or behavioral health conditions, limited mobility, advanced age, and existing unmet

health-related social needs such as food and housing insecurity) as well as those who have become vulnerable as a result of the pandemic (for example, being newly unemployed, experiencing social isolation). Certain vulnerable populations may be at particular risk of being adversely affected by COVID-19 or spreading it to others due to potentially limited or delayed testing or high rates of underlying chronic disease. They also may have more limited ability to quarantine. Further, individuals who are economically vulnerable and concerned about losing their jobs may be reluctant to get tested or follow quarantine protocols to help contain the spread because they cannot afford to stop working.

In addition, the pandemic's adverse effects (for example, uncertainty, stress, economic strain, rates of morbidity and mortality) and associated mitigation measures (for example, physical distancing, quarantines) can lead to the onset or exacerbation of depression, anxiety, excessive substance use, and other signs of distress. Public health efforts to contain COVID-19 have also further limited the availability of critical behavioral health support services. These include in-person therapy, group therapy, residential services, and support groups. Additionally, increased demand may strain social services support, including supply within food banks, while simultaneously facing decreased volunteer and employee availability.

As the pandemic worsens, state and local leaders can proactively track data related to health-related basic needs (for example, Supplemental Nutrition Assistance Program enrollment, eviction rates). In addition, they can consider actions to mitigate the impact of COVID-19 on vulnerable populations directly or by coordinating with and supporting private sector and social sector institutions. Other ideas include exploring telehealth for behavioral health, alternative sites for acute psychiatric care (where inpatient beds are reprioritized for COVID-19 cases), temporary eviction moratoriums, and changing eligibility for food assistance programs (Exhibit 8).

Exhibit 8

Needs created or exacerbated by COVID-19

Health-related basic need	Potential COVID-19-related challenges
Employment	Economic downturn threatening small businesses Spike in unemployment due to businesses closing as a result of physical distancing
Housing	Ability to quarantine compromised by living arrangements (eg, shelters, group homes) Increase in housing insecurity due to inability to pay rent
Food security	Destabilization of food safety net as a result of illness and physical distancing policies (eg, school closures, staff shortage at food agencies) Rise in food insecurity due to loss of income from layoffs and reduced hours
Transportation	Public transportation systems reducing frequency of routes Ride-share options reduced with physical distancing
Social support	Reduction of in-person social support services and socialization opportunities due to physical distancing
Education and language/literacy	Lack of educational support for students with special education or language needs during school closures Limited access to technology to continue with online learning during shutdown Rapid flow of information about COVID-19 may not be provided in appropriate languages or channels to meet needs of hard-to-reach populations
Safety (including racism/discrimination)	Increasing discrimination against certain racial/ethnic groups Exacerbation of existing racial/ethnic tensions and economic disparities Physical distancing/isolation and economic stress may trigger domestic abuse Economic stress may increase rate of crime

Domain 6: Economic health
COVID-19 is already having profound effects on the economy. The economic ramifications are projected to be significantly worse than those in the 2008 financial crisis. Unemployment claims spiked to 3.3 million in mid-March, with an additional 6.6 million added in early April. The previous record for weekly unemployment claims was 695,000, set in 1982. Most forecasts suggest that additional claims will be filed throughout April. While some relief efforts will be coordinated at the federal level, there is much that state and local policy makers can consider

to reduce the economic pain caused by COVID-19, as well as to enable rapid recovery.

First, develop the analytical fact base required to target interventions appropriately. State and local leaders will benefit from a comprehensive and dynamic understanding of which of their populations, industry sectors, business sizes, and local regions are most vulnerable to the economic effects of COVID-19. The economic impact will vary by a state or city's specific economic mix as well as by the intensity of the virus' spread in that geography.

Second, work with industry to operationalize the federal economic supports as quickly as possible. Coordinating with large businesses and industries to bolster key employers and their workforce is essential. Equally important is providing support to small business owners in navigating, applying, and obtaining some of the \$350 billion in Small Business Administration (SBA) loans. The planned legislation is more than ten times the expansion of SBA's historical annual total loan volumes of around \$25 billion, creating significant need to scale to meet the needs of the 30 million-plus small businesses in the United States, 80 percent of which are self-employed individuals and more than a quarter owned by minorities.¹⁶ Small businesses collectively employ around 60 million US workers, and the median small business has only a 27-day cash buffer. This fact alone underscores how many businesses are at risk.

Third, ensure that state and local governments are ready and able to get payments from both new federal programs and existing safety net programs into the hands of citizens quickly and easily. Given that 78 percent of US workers live paycheck to paycheck, there is not a lot of time to help individuals most in need. In our recent publication, "COVID-19: How American states can manage the surge in unemployment services," we highlight the ability to dramatically expedite unemployment benefits through a series of five levers.¹⁷

Fourth, states could develop and implement a set of economic recovery interventions that would not only provide immediate relief to people and businesses, but also build a path to a more resilient and inclusive post-pandemic economy. The interventions they identify should be influenced by the populations and businesses most at risk in the coming months and years, lessons learned from prior pandemics and global economic crises, and

lessons from other countries that are beginning to emerge from COVID-19's shadow.

State and local leaders are rightly focused on near-term solutions to provide immediate relief, some of which are outlined in Exhibit 9, below. It is also important to focus on establishing today the infrastructure, capabilities, and talent needed to recover and succeed in the post-COVID-19 economy.

3. Execute well to earn greater flexibility

This war is unlikely to be fought in clearly delineated "stages." It is more likely that leaders will need to ramp up and down the intensity of interventions (or the resources dedicated to them) over time. At present, many leaders are asking when it will be safe to relax some of the most intense restrictions on activity, such as shelter-in-place orders. Ultimately these decisions are judgments. That said, at least three aspects of this war could inform those judgments: the epidemiological reality in the community, domain performance, and the science.

Epidemiological reality

Leaders could enjoy increasing flexibility as the three conditions described below occur.

1. The *portion of the population that is actively contagious*, especially those not effectively quarantined, is sufficiently low for leaders to accept the risks associated with relaxing restrictions.

2. The *rate of new infections* is sufficiently low that leaders are confident that the total of active cases will decline in the near future. Preliminary analysis of outbreaks in Wuhan, China, Lodi, Italy, and South Korea suggest that containing the rate of new infections below 6 percent may stabilize the population over the course of 17 to 24 days.

Exhibit 9

Levers for immediate relief

	Example specific measures	
 <p>People</p> <p><i>People-oriented interventions should be tailored to account for underemployed populations and vulnerable populations</i></p>	Protect current employment	Support continued employment through targeted wage subsidies
	Enable rapid returns to the workforce	Reduce barriers to accessing work (eg, ease licensing requirements) Create COVID-19 response job portals to connect the unemployed or underemployed with companies seeing spikes in demand
	Support critical needs	Ease critical expenses through residential loan forbearance measures or eviction freezes Identify and communicate to beneficiaries of any stimulus funding measures to ensure appropriate enrollment
 <p>Businesses</p> <p><i>Business-oriented interventions should be tailored to account for specific sectors (eg, tourism, airlines), business sizes (eg, SMBs), and regional differences (eg, rural vs urban)</i></p>	Improve liquidity/ cash flow	Ease financial obligations (eg, postpone/waive taxes or fees for SMBs or hardest hit sectors, commercial mortgage loan forbearance measures) Accelerate state's payment of outstanding AP ¹ to state vendors Facilitate process for SBA loans/grants (eg, portal to support application prep)
	Invigorate demand	Target affected sectors and SMBs with dedicated state purchasing/ procurement programs Shift attention to demand spikes and essential needs
	Restart/ continue operations	Support shift to remote operations (eg, expanded WiFi coverage, targeted loans for remote work equipment)

¹ AP, accounts payable; SMA, Small Business Administration; SMB, small- and mid-sized businesses.

3. Confidence there is sufficient *health system capacity* to meet three types of potential demand. First, health systems will be able to treat new and existing COVID-19 patients with a proper and consistent standard of care.¹⁸ Second, health systems have the capacity to treat emergent non-COVID-19 patients with an appropriate standard of care. Third, health systems have enough capacity to accommodate a potential surge in cases should the virus reemerge—this may mean maintaining surge beds and supplies ready for reactivation.

In addition, leaders would benefit from understanding the scale and degree of potential immunity to COVID-19 developing among the populations in their communities.

Domain performance

All else being equal, the stronger the performance achieved across domains the greater the flexibility leaders may have to relax restrictions. For example, leaders may feel more confident about relaxing restrictions on certain types of activity as they become confident those activities are sufficiently safeguarded and the necessary public health capabilities are in place. It may also be true that the stronger the performance in one domain, the less resource or intensity will be needed in the others.

The science

While effective treatment, prophylaxis, and vaccines would be the most welcome

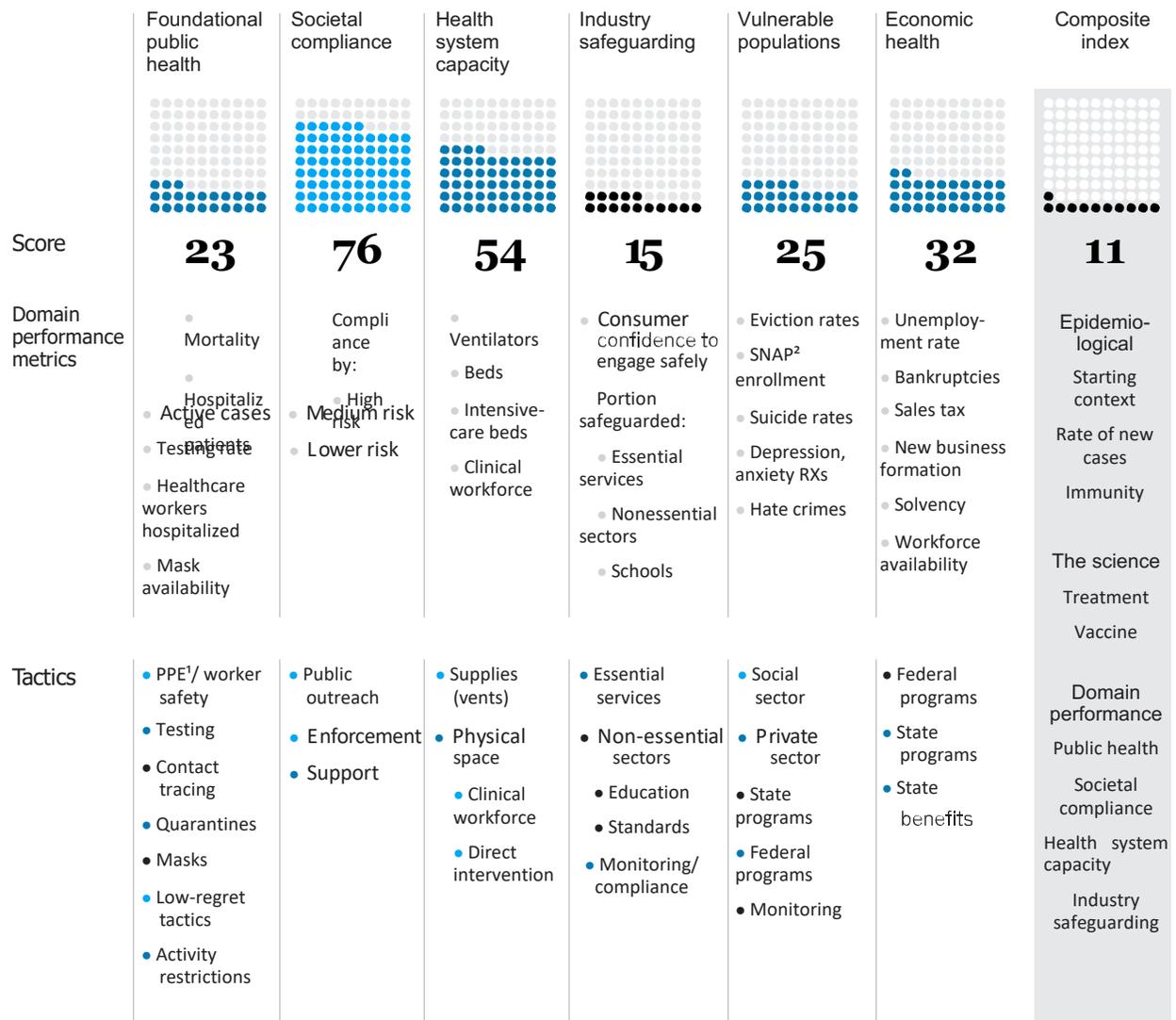
Exhibit 10

A COVID-19 War Dashboard helps connect actions to outcomes.

Illustrative COVID-19 dashboard performance score by domain

Degree of activation

• High • Medium • Low



¹Personal protective equipment.

²Supplemental Nutrition Assistance Program.

innovations, leaders will likely need to navigate choices well before the science is definitive.

That said, the pace and scope of research across the public and private sectors appears to be growing rapidly. Moreover, the diversity in approaches observed across the United States (and globally) is fertile ground for analysis of real-world evidence.

Monitoring, understanding, and applying the rapidly growing body of science could make a considerable difference in the approach of states and cities. These locales would benefit by most closely monitoring three issues:

1. *Ability to limit new infection*, including the expected timeline to effective vaccination and pre- and post-exposure prophylaxis

2. *Treatment efficacy*, to reduce disease severity and decrease healthcare resource need
3. *Transmission*, most importantly the extent to which asymptomatic people transmit the disease and the relative role of direct (i.e., person-to-person) versus indirect (for example, from contaminated surfaces) transmission.

To assist leaders in making these choices, we have created an illustrative COVID-19 War Dashboard (Exhibit 10). This dashboard highlights the most critical measures of success in each domain and the key interventions that can be “activated” to achieve

these results (for example, adding resources, increasing intensity, improving execution).

Leaders could also create and use a “composite index” to empirically measure the epidemiological reality in their communities, domain performance, and the state of the science.

We hope that these perspectives are useful in fighting the COVID-19 war. Protecting our lives and our livelihoods may be the challenge of our time. We will update these perspectives and data regularly to reflect new information.