COVID-19 is, first and foremost, a global humanitarian challenge. Thousands of health professionals are heroically battling the virus, putting their own lives at risk. Governments and industry are working together to understand and address the challenge, support victims and their families and communities, and search for treatments and a vaccine.

Companies around the world need to act promptly. This document is meant to help senior leaders understand the COVID-19 situation and how it may unfold, and take steps to protect their employees, customers, supply chains and financial results.
COVID-19 has seen a consistent case decline in countries that had experienced rapid case growth early (esp. China, South Korea)

However, cases outside of Asia are growing dramatically, driven primarily by complexes in Europe and the Middle East. The United States, while it has confirmed only a limited number of new cases, appears to be set for a large increase in cases once testing kits become widely available

### Possible future scenarios

**Delayed Recovery:** The virus continues to spread across the Middle East, Europe and US until mid Q2, when virus seasonality combined with a stronger public health response drives case load reduction

**Prolonged Contraction:** The virus spreads globally without a seasonal decline, creating a demand shock that lasts until Q2 2021. Health systems are overwhelmed in many countries, especially the poorest, with large-scale human and economic impact

### Actions for companies to consider

A central, cross-functional Nerve Center can coordinate efforts to:

- Protect employees and give them a strong sense of shared purpose
- Stress-test financials
- Stabilize the supply chain
- Engage customers

Sources: World Health Organization Situation Reports, news reports, McKinsey analysis
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COVID-19 appears to be more dangerous than the flu

Latest as of March 15, 2020

Features of the disease to date

1.5-2x

Higher reproduction than the flu

Up to 20%

Of cases have a severe/critical form of the disease

~0.9%

Case Fatality Ratio in South Korea after widespread testing. CFR appears higher where cases are missed and is higher when health systems are overwhelmed

Comparison to other diseases

Early identification of the disease, intensification of viral control, and treatment, when available, will reduce reproduction number and case fatality

Reproduction number (average number of people infected by each infected person in outbreak setting)

Case Fatality (proportion of deaths among confirmed cases)

Sources: World Health Organization, CDC, Nature, The Lancet, PLOS One The Journal of Infectious Diseases, BMC Infectious Diseases, Infectious Disease Modelling, news reports

1. Evidence on exact numbers are emerging, however expected to decrease as viral containment measures intensify and treatments are developed
2. WHO estimates the global average CFR at 3.4%, dependent on conditions such as patient age, community immunity, and health system capabilities. Latest case fatality ratios were calculated as death/cases
3. In outbreak setting or the introduction of a new disease
4. Case Fatality numbers reflect outbreak settings and factors such as the patient's age, community immunity and health system capabilities
5. Estimates are very context and time specific, however are provided from prior outbreaks based on academic lit review
6. WHO estimates 15% severe and 5% critical
The global spread is accelerating with more reports of local transmission

Latest as of March 15, 2020

<table>
<thead>
<tr>
<th>Impact to date</th>
<th>&gt;153,000</th>
<th>&gt;5,700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported confirmed cases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deaths</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| >140 | >80 | ~40 |
| Countries or territories with reported cases | Countries or territories with evidence of local transmission | Countries or territories with more than 100 reported cases |

| <1% | ~75% | >40 |
| China’s share of new reported cases March 9th-15th | New reported cases on March 9-15th from Europe | New countries with cases March 9th-15th |

1. Previously counted only countries; now aligned with new WHO reports; excluding cruise ship; 2. Previously noted as community transmission in McKinsey documents; now aligned with WHO definition

Sources: World Health Organization, CDC, news reports

Current as of March 16, 2020
The virus is located in 5 major “transmission complexes”

A complex is an area with confirmed local transmission, and more than 100 confirmed cases, where it is difficult to prevent people’s movement.

- **Europe**
  - Total cases: >45,000
  - Total deaths: >1,700

- **China complex**
  - Total cases: >81,000
  - Total deaths: >3,200

- **Asia (excl China)**
  - Total cases: >10,100
  - Total deaths: >110

- **Middle East**
  - Total cases: >13,900
  - Total deaths: >620

- **Americas**
  - Total cases: >2,300
  - Total deaths: >40

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1. WHO data is lagging news reports for the US; In the US, CDC & WHO reports >1,600 cases; NYTimes reports >3,600 cases
2. Includes Western Pacific and South-East Asia WHO regions; excludes China; Note that South Korea incremental cases are declining, however other countries are increasing
3. Eastern-Mediterranean WHO region

Source: World Health Organization, team analysis
Progression varies widely among countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Status</th>
<th>Recent Actions</th>
</tr>
</thead>
</table>
| China     | New cases at low levels throughout China                               | Strict containment and quarantine  
Significant testing at facilities and in Hubei  
Construction of makeshift hospitals to increase capacity |
| >81,000   | >3,200 Cases                                                          |                                                                                                                                           |
| Cases     | ~4.0% Deaths                                                          |                                                                                                                                           |
|           | Case Fatality$^2$                                                      |                                                                                                                                           |
| South Korea| New cases declined ~75% in the last week with potential decline or plateau$^1$ | Significant preparedness & rapid regulatory approval process for tests  
Rapid roll-out of diagnostics (e.g., diagnostic drive-through)  
Hospitalization available for lower-severity cases & significant hospital coordination |
| >8,100    | >70 Cases                                                             |                                                                                                                                           |
| Cases     | ~0.9% Deaths                                                          |                                                                                                                                           |
|           | Case Fatality$^2$                                                      |                                                                                                                                           |
| Italy     | ~3,500 new cases on March 15$^{th}$ – the highest in the world, corresponding to a ~180% increase in the last week$^1$ | Efforts initially focused on Northern Italy, but efforts now extend to the entire country, including cancellations of larger gatherings  
Healthcare recruiting efforts due to strain  
Schools closed nationwide |
| >21,100   | >1,400 Cases                                                          |                                                                                                                                           |
| Cases     | ~6.8% Deaths                                                          |                                                                                                                                           |
|           | Case Fatality$^2$                                                      |                                                                                                                                           |
| US$^3$    | US cases are increasing daily, however official reporting may be lagging$^1$ | A national emergency was declared on March 13 with Congress aiming to provide testing free of charge  
>29 states have declared emergency with a range of actions including school closures, bans on large gatherings and large-scale testing plans |
| >1,600    | >40 Cases                                                             |                                                                                                                                           |
| Cases     | ~2.4% Deaths                                                          |                                                                                                                                           |
|           | Case Fatality$^2$                                                      |                                                                                                                                           |

1. Number of new confirmed cases on March 15th compared to March 8th
2. Case Fatality calculated as (total deaths)/(total cases) – this rate is evolving and dependent upon several factors, including number of suspected cases that are tested
3. WHO data is lagging news reports for the US; in the US, CDC & WHO reports >1,600 cases; NYTimes reports >3,600 cases

Source: WHO situation reports, US CDC, press search

Current as of March 16, 2020
Overall, ~20% of cases are estimated to be severe/critical, requiring significant health capacity for testing and critical care infrastructure.

**WHO estimated global distribution by severity of symptoms**

- **Mild**: 80%
- **Severe**: 15%
- **Critical**: 5%

Higher severity has potential to overwhelm hospital systems given that these cases may require treatment.

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Source: JAMA, WHO March 6 reports, JAMA, WSJ and associated press interviews with Italian physicians
People 50+ in age are ~40-76% of diagnosed cases
As of data from Feb 11 in China and as of March 16 and 15 in South Korea and Italy* respectively

Context
In all three countries, there is a significant difference in the age distribution
There is only a small percentage of cases found among the youngest populations (0-19) despite frequent contact with other individuals (school, public transport)

Total cases by country and age segment, Percent by age segment

South Korea
- 52% 0-19
- 32% 20-49
- 10% 50-69
- 10% Undiagnosed (TBD)

China
- 44% 0-19
- 42% 20-49
- 12% 50-69
- 2% Undiagnosed (TBD)

Italy
- 24% 0-19
- 37% 20-49
- 38% 50-69
- 1% Undiagnosed (TBD)

~0.8-.9% fatalities
~2.3-4.0% fatalities
~4.3-7.2% fatalities

1. Italy reports age segments slightly differently than South Korea and China thus categories are rounded
2. Note - Data reported from ISS March 15 reports 7.2%, however latest deaths/cases from WHO indicates this may be higher
2. Note - Data reported from China Feb 11 reports 2.3%, however latest deaths/cases from WHO indicate this may be higher

Source: Korea CDC, China CDC, ISS Italian National Health Service
Case fatality rate data from three countries shows that older populations are at greater risk overall

As of data from Feb 11 in China and as of March 16 and 15 in South Korea and Italy* respectively

WHO has estimated global case fatality rates at 3.4%

Rates vary significantly by age, co-morbidity, health system strength and other factors

WHO has estimated global case fatality rates at 3.4%

Rates vary significantly by age, co-morbidity, health system strength and other factors. 

Fatalities may lag incremental case reporting

6.8-7.2% Avg Italy¹

2.3-4.0% Avg China¹

0.8-0.9% Avg South Korea

Source: L’Istituto Superiore di Sanità (ISS) Italy, WHO, Korea CDC, China CDC

1. Note - data reported from China Feb 11 reports 2.3%, however latest deaths/cases from WHO indicate this may be higher
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**The situation now**

**Epidemiological scenarios**

**Delayed Recovery**
- China and East Asian countries continue their current recovery and control the virus by late Q1 or early Q2 2020
- European and US case count growth rises rapidly through mid-April

**Prolonged Contraction**
- China and East Asian face a surge of re-infection as they attempt to restart economic activity
- The virus is not seasonal with a mutated virus resurfacing in the fall of 2020

**Economic impacts**

- China and East Asian countries start recovery but supply chains remain impaired
- US and Europe large-scale quarantines, travel restrictions, and social distancing drive drop-off in consumer spending and business investment in 2020

- China and East Asia experience double-dip slowdowns as the economic recovery is derailed in 2020 and pushed into Q1 2021
- The US and Europe experience demand-side reductions in consumer and business spending and deep recessions in 2020

Sources: World Health Organization Situation Reports, news reports, McKinsey analysis

Current as of March 16, 2020
Delayed recovery

The virus continues to spread across the Middle East, Europe and US until mid Q2, when virus seasonality combined with a stronger public health response drives case load reduction.

### Epidemiological scenario

- European and US case count growth rises rapidly through mid-April.
- Tests available, and extent of cases fully discovered by mid-April; More aggressive shutdowns and social distancing slows spread.
- New case counts peak by end April and declines by June with stronger public health response and seasonality of virus.
- Fall 2020 sees a resurgence of the virus. Although countries have better public health preparedness globally.
- Iran continues to be epicenter in Middle East; South East and South Asia, Africa, and Latin America are spared worst effects due to their warm climates and young demographics.
- China and East Asian countries continue their current recovery and control the virus by late Q1 or early Q2 2020.

### Economic impacts

- China and East Asian countries start recovery but supply chains remain impaired in much of Q2 and consumer spending subdued.
- In US and Europe, large-scale quarantines, travel restrictions, and social distancing drive drop-off in consumer spending and subsequently business investment in 2020:
  - Layoffs drive unemployment rates higher.
  - Corporate bankruptcies spike, putting pressure on the banking/financial system.
  - Monetary easing has limited impact with already low rates and fiscal responses prove insufficient and poorly timed.
  - Self-reinforcing recession dynamics extend GDP declines through Q3; recovery begins in Q4.

2020 Global GDP growth falls sharply, driven by recessions in US and Europe and slower growth in China and other Asian countries.
Prolonged contraction

The virus spreads globally without a seasonal decline, creating a demand shock that lasts until Q2 2021. Health systems are overwhelmed in many countries, especially the poorest, with large-scale human and economic impact.

Epidemiological scenario

European and US public health measures deliver initial containment of the virus only by early June.

The virus does not prove to be seasonal with a mutated virus resurging in the fall of 2020, leading to a spike in cases across geographies throughout Q2.

Restrictions on travel and quarantines in the US, Europe, China, and East Asia are tightened further in an attempt to stem the tide.

Iran continues to be epicenter in Middle East; South East and South Asia, Africa, and Latin America are spared worst effects due to their warm climates and young demographics.

China and East Asian countries face a surge of re-infection as a result of attempt to restart economic activity.

Economic impacts

China and East Asia experience double-dip slowdowns as the economic recovery is derailed in 2020 and pushed into Q1 2021.

The US and Europe experience demand-side reductions in consumer and business spending and deep recessions in 2020.

• Layoffs and bankruptcies in the most affected sectors rise sharply throughout 2020, feeding into a self-reinforcing downward spiral.

• Financial system distress is significant but a full-scale banking crisis averted due to better capitalization of banks and new macro-prudential supervision in place.

• Fiscal and monetary policy responses prove insufficient to break the headwinds.

The global economic impact is severe, with significant GDP contraction in most major economies in 2020 and a slow-moving recovery beginning in only Q2 2021.
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A crisis nerve center can play an important role in planning and managing COVID-19 responses

Crisis nerve centers can help in situations with **three determining features**:

- A disruption or crisis requires immediate attention. It may have arrived or be imminent
- The situation is novel due to the nature or scale of the threat, which distinguishes it from a “routine emergency”
- The disruption is unfolding faster than the organization can understand or interpret using the usual approaches, such as an extensive strategic study

COVID-19 fits these criteria, so a nerve center may help companies quickly assess the situation and consider and choose plans of action, and execute those plans.

When standing up a nerve center, consider **four key actions**:

- **Discover** an accurate view of the situation through multi-source “listening posts,” assess how it might evolve, and derive implications for the organization
- **Design** a trigger-based portfolio of actions – immediate and strategic – with a pragmatic operating model to develop detailed plans and act on them
- **Decide** on strategic actions quickly after stress-testing of hypotheses and alternatives, and ensuring adherence to company and societal values
- **Deliver** in a disciplined, efficient way, keeping sufficient flexibility to adapt to the changing landscape
Example COVID-19 Response Structure: 5 teams, 18 workstreams

Based on discussions with risk and health professionals and more than 200 companies across sectors

<table>
<thead>
<tr>
<th>Team</th>
<th>Workstream</th>
<th>Workstream Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Workforce protection</strong></td>
<td>1. Policy &amp; Management</td>
<td>Portfolio of policies and actions incl. prevention and incident response</td>
</tr>
<tr>
<td></td>
<td>2. Two Way Communication</td>
<td>Multi-channel communications</td>
</tr>
<tr>
<td></td>
<td>3. Personnel &amp; contractors</td>
<td>Tiering (all/some/no WFH)</td>
</tr>
<tr>
<td></td>
<td>4. Facility &amp; On-site norms</td>
<td>Staggering work shifts/times</td>
</tr>
<tr>
<td></td>
<td>5. Health &amp; Govt engagement</td>
<td>Local &amp; federal regulators and public health officials</td>
</tr>
<tr>
<td><strong>B. Supply Chain Stabilization</strong></td>
<td>1. Supplier engagement</td>
<td>Cross-tier risk transparency</td>
</tr>
<tr>
<td></td>
<td>2. Inventory management</td>
<td>Critical part identification</td>
</tr>
<tr>
<td></td>
<td>3. Production &amp; Operations</td>
<td>Operational impact assessment</td>
</tr>
<tr>
<td></td>
<td>4. Demand management</td>
<td>S&amp;OP SKU-level demand signal estimates by macro scenario</td>
</tr>
<tr>
<td></td>
<td>5. Logistics</td>
<td>Ports</td>
</tr>
<tr>
<td><strong>C. Customer engagement</strong></td>
<td>1. B2B transparency</td>
<td>Comms to B2B customers (e.g., microsite)</td>
</tr>
<tr>
<td></td>
<td>2. Customer protection</td>
<td>Prevention interventions across customer journey</td>
</tr>
<tr>
<td></td>
<td>3. Customer outreach</td>
<td>Customer comms re: COVID-practices</td>
</tr>
<tr>
<td><strong>D. Stress-test financials</strong></td>
<td>1. Scenario definition</td>
<td>Relevant scenarios based on latest epidemiological &amp; economic outlook</td>
</tr>
<tr>
<td></td>
<td>2. Financial stress tests</td>
<td>Financials in different scenarios, especially working capital requirements</td>
</tr>
<tr>
<td><strong>E. Operate nerve center</strong></td>
<td>1. Issue map &amp; management</td>
<td>Single source of truth for issue resolution &amp; tapping surge resources where needed</td>
</tr>
<tr>
<td></td>
<td>2. Portfolio of actions</td>
<td>Trigger-based portfolio of actions (across all workstreams above)</td>
</tr>
<tr>
<td></td>
<td>3. Leadership alignment</td>
<td>Align leaders on scenarios</td>
</tr>
</tbody>
</table>

Based on discussions with risk and health professionals and more than 200 companies across sectors.

Current as of March 16, 2020

See next slides
Example Nerve center for a pandemic response

<Real sanitized example>

Executive team

Leadership team
Medical | Security | Response lead

Medical advisory council

Crisis Nerve Center PMO

Comms+Reg
Regulatory alignment (e.g., dispensations)
3rd party comms (e.g., to partners) as required

Colleagues
Communicate across employee channels
2 way feedback (ombuds, survey, email, call)

Supply Chain
Disruption, restart support (e.g., loans)
Exposure across tiers
Inventory mgmt.

Real Estate
Building management
Factory management

Technology
Work from home execution/ infra
Special employee segment management (e.g., where WFH not possible)

Financial
Financial stress-testing

Overall guidelines/ policies
Guides for frontline managers

Scenarios
Issue map
Oper cadence

1. Includes procurement, supply chain, and logistics
A: Organizations should consider how to protect their workforce

Overall policies should consider safety first, especially for high risk individuals, as well as how to maintain business operations

These should be in-line with local health authority guidance and regulatory requirements

<table>
<thead>
<tr>
<th>Checklist of things to consider</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Policy &amp; Management</strong></td>
</tr>
<tr>
<td>1. Develop <strong>policies</strong> which adhere to public health recommendations and workplace laws, including on sick leave, as well as business priorities/continuity</td>
</tr>
<tr>
<td>2. Set policies for <strong>remote working and who can access the workplace</strong> at what times (e.g., staggering shifts, business-critical employees on site only)</td>
</tr>
<tr>
<td>3. Set <strong>sign off processes</strong> for policy changes</td>
</tr>
<tr>
<td><strong>II. Two way Communication</strong></td>
</tr>
<tr>
<td>1. Select <strong>communication channels</strong> and set protocols to communicate early and often</td>
</tr>
<tr>
<td>2. Develop approach for <strong>cascaded communications</strong> to provide clarity and direction</td>
</tr>
<tr>
<td>3. Establish <strong>two-way communication</strong> and confidential reporting for employees</td>
</tr>
<tr>
<td>4. Use <strong>official authorities</strong> for information (e.g., WHO and CDC)</td>
</tr>
<tr>
<td><strong>III. Personnel &amp; contractors</strong></td>
</tr>
<tr>
<td>1. Identify and tier <strong>critical functions</strong> and roles, including back-office functions</td>
</tr>
<tr>
<td>2. Assess <strong>infrastructure needs</strong> for remote working or other flexible models (e.g., VPN, broadband, laptops, remote desktop, etc.); consider piloting / testing system first to learn and adapt (e.g., everyone on multi-day pilot, remote desktop trials with subset of employees)</td>
</tr>
<tr>
<td>3. Adapt <strong>reporting and sign off processes</strong> to reduce loss of productivity (e.g., devolved responsibility); consider training managers on how to manage remotely</td>
</tr>
<tr>
<td>4. Agree on <strong>adaptations required for collective bargaining units</strong> (e.g., unions, int’l work councils)</td>
</tr>
<tr>
<td>5. Agree on policies and incentives with <strong>contractors</strong></td>
</tr>
<tr>
<td><strong>IV. Workplace &amp; norms</strong></td>
</tr>
<tr>
<td>1. Implement physical mechanisms to <strong>reduce transmission</strong> (e.g., cleaning, staggering shifts)</td>
</tr>
<tr>
<td>2. Communicate with site leaders / N-1 leaders to <strong>clarify accountability and authority</strong> (e.g., WFH) – err on side of agile and localized decision-making</td>
</tr>
<tr>
<td>3. Define <strong>contingency plans</strong> for workplace closures (e.g., seating capacity in other buildings)</td>
</tr>
<tr>
<td><strong>V. Health and Govt engagement</strong></td>
</tr>
<tr>
<td>1. Engage with <strong>health officials</strong> to assess risk and response</td>
</tr>
<tr>
<td>2. Collaborate with healthcare <strong>providers and payors</strong> to access appropriate care for individuals (e.g., health plan hotline)</td>
</tr>
<tr>
<td>3. Collaborate with appropriate <strong>government officials</strong> and other regulatory bodies to inform and implement policies</td>
</tr>
</tbody>
</table>

Current as of March 16, 2020
A: Across these areas organizations are taking a range of actions

**Examples of actions**

<table>
<thead>
<tr>
<th>Basic</th>
<th>Moderate (includes Basic)</th>
<th>Extensive (includes Basic and Moderate)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Policies &amp; Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remind employees of sick policy and adapt as needed</td>
<td>Expand sick-leave policy and primary caregiver policy</td>
<td>Quarantine affected employees including C-suite leadership</td>
</tr>
<tr>
<td>Circulate guidelines for employees who recently travelled to high risk areas or display symptoms</td>
<td>Restrict non-essential travel as well large gatherings</td>
<td>Develop specific policies limiting gatherings to X number of people</td>
</tr>
<tr>
<td>Choose a lead and set a process to review policies</td>
<td>Prepare detailed guidance for functions on regulatory requirements</td>
<td>Collaborate with industry colleagues to share best practices</td>
</tr>
<tr>
<td>Ask all locations to assess their risk and define potential actions</td>
<td>Develop C-1 and C-2 contingency plans</td>
<td></td>
</tr>
<tr>
<td><strong>II. Two way Communication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Publish communications (regularly and in response to major events) including who to contact with questions, policies on remote working and travel, and resources on hygiene and health; assign multidisciplinary comms. leads to control messaging across functions</td>
<td>Provide real-time communication channels, nurse hot-line, and ombudsman support</td>
<td>Cascade communications via site leaders / regional leaders</td>
</tr>
<tr>
<td>Post hand-washing instructions and other hygiene resources in visible locations such as bathrooms</td>
<td>Develop confidential and compliant self-reporting mechanisms</td>
<td>Develop a global central intranet page with updated policies and information, automatic alerts from key sources, guidance by region (linked to country guidance)</td>
</tr>
<tr>
<td><strong>III. Personnel</strong></td>
<td></td>
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</tr>
<tr>
<td>Provide work from home options and infrastructure where feasible</td>
<td>Encourage all non-direct labor to work remotely</td>
<td>Enforce work from home for affected offices or functions</td>
</tr>
<tr>
<td>Send tips on remote working</td>
<td>Install VPN for employees; provide devices where needed</td>
<td>Add redundancies for all critical enablers for remote working (e.g., additional telecom subscription or laptops)</td>
</tr>
<tr>
<td>Collaborate with contractors on planning for outbreak</td>
<td>Sluggish work schedules to reduce crowding</td>
<td>Develop tools to allow traveling / remote employees to assess risk and obtain guidance for specific territories</td>
</tr>
<tr>
<td>Provide personal protective gear for select frontline workers where appropriate (e.g., healthcare professionals)</td>
<td>Ensure sick leave is understood by all employees including contractors</td>
<td>Provide guidance on productivity during WFH for field staff for when they cannot conduct visits (e.g., trainings)</td>
</tr>
<tr>
<td></td>
<td>Develop contingency plans for all middle/back office</td>
<td></td>
</tr>
<tr>
<td><strong>IV. Workplace &amp; norms</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify and reduce risk factors for transmission (e.g. shared tools)</td>
<td>Implement shifts to reduce overcrowding</td>
<td>Temporarily close offices in highly affected areas</td>
</tr>
<tr>
<td>Sanitize common areas and workspace more frequently</td>
<td>Restrict factory floor access; Restrict HQ access in affected area to outside visitors</td>
<td>Provide on-site health personnel to provide information and answer questions and offer health checks at facilities</td>
</tr>
<tr>
<td>Provide hygiene supplies in key areas and encourage handwashing</td>
<td>Divide production facilities by splitting critical workforce across different locations, sealing areas and doing handovers without physical contact</td>
<td>Convert fingerprint access to retinal access to reduce transmission</td>
</tr>
<tr>
<td>Limit cafeteria style food and communal snacks</td>
<td>Increase spacing between seating in cafeterias and conference rooms</td>
<td></td>
</tr>
<tr>
<td>Increase ventilation by opening windows and ensuring filters are replaced where needed</td>
<td>Develop manager accountability and plan for staffing (e.g., hospitals, manufacturing)</td>
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</tr>
<tr>
<td>Encouraged non-handshake greetings &amp; social distancing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit meeting sizes / conduct virtual meetings</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Health &amp; Govt Engagement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review WHO and local regulatory guidelines</td>
<td>Develop a risk assessment in partnership with a health professional</td>
<td>Conduct periodic testing with agency</td>
</tr>
<tr>
<td>Identify nearest healthcare providers / testing sites and collaborate with health insurers</td>
<td>Establish testing protocol with local regulatory bodies</td>
<td></td>
</tr>
</tbody>
</table>

Source: Press search, organization interviews

*Current as of March 16, 2020*
A: Organizations should consult official health sources for information, guidance, and tools
Examples provided; Please check online for latest information

**WHO**
Situation reports and information examples

https://www.who.int/news-room/q-a-detail/q-a-coronaviruses

**CDC**
Overall prevention, business guidance, and industry guidance examples


**Local health authorities & adapted info**
Overall information, business guidance, public poster examples

https://www.nhs.uk/conditions/coronavirus-covid-19/

Source: CDC, WHO, NHS, SF Public Health Dept
A: Policies & Management

Organizations should develop company-wide policies to each of these scenarios and work with local leaders to tailor / adapt.

**Sick family member**
An employee indicates that their family member recently tested positive for COVID-19 and they were exposed. They also recently attended the latest company retreat.

**Exposure on the line**
One employee on the floor or call center tested positive for COVID-19. At least 20 other individuals were exposed, including some temp agents.

**Colleague may be sick**
Employee observes that a colleague is starting to exhibit symptoms of illness; they have an underlying health condition and request to WFH.

**Workforce remote**
Company has made decision to make all employees in a site work remotely. All critical functions are being performed remotely, for the first time.

**Workforce on sick leave**
After a recent exposure, the next day 60% of the workforce call in sick. Critical functions are now at risk.

**C-Suite symptoms**
The CEO and CFO both recently came down with possible symptoms. They are both in the same location, yet offices exist around the world.
B: There are multiple end-to-end immediate supply chain actions to consider in response to COVID-19.

1. **Create transparency on multi-tier SC**
   - Determine critical components, and determine origin of supply
   - Assess interruption risk and identify likely Tier 2+ risk
   - Look to alternative sources if suppliers in severely affected regions

2. **Analyze available inventory**
   - Estimate inventory along the value chain, including spare parts/re-manufactured stock
   - Use after sales stock as bridge to keep production running

3. **Optimize production and distribution capacity**
   - Assess impact on operations and available resource capacity (mainly workforce)
   - Ensure employee safety and clearly communicate with employees
   - Conduct scenario planning and assess impact on operations based on available capacity

4. **Estimate realistic final customer demand**
   - Work with S&OP to get demand signal to determine required supply
   - Leverage direct communication channels with direct customer
   - Use market insights/external databases to estimate for customer’s customers

5. **Leverage available logistics capacity**
   - Estimate available logistics capacity for air/sea/road/rail
   - Accelerate customs clearance
   - Change mode of transport and pre-book air/rail capacity given current exposure
   - Collaborate with all parties to jointly leverage freight capacity
B: Supply chain actions to consider in the next two to four months

- Evaluate alternative sourcing for all materials impacted – availability of suppliers, additional cost due to logistics, tariffs, estimated component price increases
- Enhance the demand verification process to correct inflated demand to mitigate the whiplash effect
- Provide continuous support to small and mid-sized tier 2-3 suppliers in financial trouble
- Assess regional risks for current and backup suppliers
- Establish a supply chain risk function
- Digitize process and tools to integrate demand, supply, and capacity planning
- Trigger the new supply network design for resilience
- Codify the processes and tools created during the crisis management as formal documentation
- Convert war room into a reliable risk management process
- Work with public agencies to explore opportunities for support
- Engage investors and other stakeholders to improve transparency and get help

Continuous improvement material supply stability

Kick off designing resilient supply chain for the future

Build collaborative relationships with external partners

Current as of March 16, 2020
Supply chains are being disrupted around the world, but the full impacts have not yet been felt

### Supply – production

- **80% plants restarted**
  Across China, ex-Hubei, with large enterprises restarting, albeit with ~60% capacity, at much higher rate than smaller ones

- **2M idle containers**
  8.8% of global container capacity affected by reduced demand

- **52% BDI increase**
  Baltic Dry Index² 52% higher since CLNY³ but at same level as Feb 2019

### Logistics – transportation

- **60% China flights suspended⁶**
  Commercial flights account for ~50% of air cargo capacity, some airlines converting flights for cargo

- **2x TAC index**
  TAC index rate +98% for US-China, +117% EU-China, +21% China-US, and +2% for China-EU since CLNY³

### Customer demand

- **90% decline in car sales**
  China consumer sentiment sharply lower; online/express deliveries up

### Situation today

- **80% plants restarted**
- **2M idle containers**
- **52% BDI increase**
- **60% China flights suspended⁶**

### What to expect

- **MED**
  Parts and labor shortages leading to further SC disruptions (e.g., decreased production capacity)
  Future capacity 2.3% reduction for a Asia-US route from May due to sea freight alliance revisions
  Impact on freight will take an extended period of time to correct with slower ramp-up

- **7,000 TEU/wk reduction**
  Volumes will return as factories restart, may see peak for restocks

- **5% global air traffic decrease⁴**
  Decline in capacity available due to travel ban on commercial flights
  YoY global air freight belly capacity reduction of 14% in March 2020⁴
  Rates likely to continue to increase

- **MED**
  Demand for express last-mile delivery has spiked in China due to quarantine and social distancing

### Impact

- **High**
  Demand slump may persist

- **Medium**
  China consumer sentiment sharply lower; online/express deliveries up

- **Low**
  China air cargo capacity unaffected

Source: Baidu, WSJ, Bloomberg, Alphaliner, Quartz, TAC index, IATA, Seabury Consulting, A.P. Moller-Maersk Group of Denmark, Agility Logistics

1. Assessment of risk premium to ship raw materials on a number of shipping routes, data as of 3/13
2. Frankfurt (FRA) to Shanghi (PVG) used as a proxy
4. Estimated prior to implementation of EU-US travel ban
5. Commercial flights from China
6. Companies such as Cathay Pacific and Singapore Airlines now starting to fly empty passenger aircrafts as dedicated cargo planes

Current as of March 16, 2020
COVID-19 Leading indicator dashboard
Propagation of COVID-19 across new transmission complexes

1. Includes Western Pacific (excl China) and South-East Asia WHO regions
2. Eastern Mediterranean WHO region
Note: All countries or regions have documented 3rd generation cases

Current as of March 16, 2020

Source: WHO Situation Reports, TomTom traffic index, Baidu QianXi, CDC, IATA, BBC, NYT, Japan Times, NPR, Reuters, press research
COVID-19 Leading indicator dashboard for China
Tracking toward economic restart

**Hubei impact**
How deep is the impact, and when could economic activity restart?

- **Late Q2**
  - Hubei remains deeply impacted; return to economic activity tough to foresee until mid Q2

**China economic restart**
When could economic activity restart in China (ex-Hubei)?

- **Late Q1**
  - Restart has begun, especially for larger companies, despite challenges such as labor shortages and movement of goods

**China consumer confidence**
When will Chinese consumer confidence and purchasing activity return?

- **Q2**
  - Consumer spending in China spend may lag behind economic restart

**Recovery milestones**
- Steady decline in confirmed cases
- New suspected and confirmed cases rates consistent with other provinces
- Quarantine lifted
- Public transport resumes
- Factory activity returns to pre-outbreak levels

**Daily infection rate, per million**
- Jiangsu: 7
- Shandong: 4
- Zhejiang: 7
- Guangdong: 9
- Shenzhen: 11
- Shanghai: 6
- Chongqing: 7
- Wuhan: 8

**Crude case fatality ratio**
- Hubei: ~4.6%
- China other (avg.): ~1.1%

**Labor availability**
- (movement of workers to major industrial provinces)

- Jiangsu: 7
- Shandong: 4
- Zhejiang: 7
- Guangdong: 9
- Shenzhen: 11
- Shanghai: 6
- Chongqing: 7
- Wuhan: 8

**Return to work index**
- (largest manufacturing cities by output in mainland China)

- Shenzhen: 54%
- Shanghai: 57%
- Chongqing: 50%
- Wuhan: 18%

**Air pollution (NO2 level)**
- 32% decline in Beijing
- 24% decline in Shenzhen

**PMI manufact.**
- 14pt decline in Feb

**Formative factors**
- Labor shortages
- Movement of goods
- Increased demand for consumer behavior metrics

**Example consumer behavior metrics**
- Retail passenger car sales down 92%
- Smartphone sales down 37%
- Spending on food & drinks down $60B in Jan and Feb
- Hotel occupancy down 80%

**Source:** WHO Situation Reports; National Bureau of Statistics of China; McKinsey Global Institute; OCED Data, Johns Hopkins CSSE, press research, TomTom traffic index, Baidu QianXi, CDC, New York Times, Reuters, The Economist, Peking University HSBC Business School, Tencent News, Sina news, Beijing Environmental Protection Monitoring Center, Shenzhen Environment Network

**Current as of March 16, 2020**
### Middle East

#### Example country

<table>
<thead>
<tr>
<th>Country</th>
<th>Date of initial case</th>
<th>Total number of cases</th>
<th>New cases in last 14 days</th>
<th>5-day new case trend</th>
<th>Crude case fatality ratio</th>
<th>Peak case count observed</th>
<th>Number of countries/territories restricting travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>02/20</td>
<td>12,729</td>
<td>12,136</td>
<td>0.881 to 0.958</td>
<td>4.8%</td>
<td>N</td>
<td>87</td>
</tr>
<tr>
<td>Rest of region</td>
<td>02/15</td>
<td>1,221</td>
<td>1,108</td>
<td>0.349</td>
<td>1.2%</td>
<td>N</td>
<td>Data N/A</td>
</tr>
</tbody>
</table>

#### Epidemiological Indicators

<table>
<thead>
<tr>
<th>Current phase</th>
<th>CDC travel health notice</th>
<th>Traffic congestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1: Small number of cases identified; no sustained local transmission</td>
<td>Warning Level 3</td>
<td>03/16/2019</td>
</tr>
<tr>
<td>Stage 2: Disease spread and sustained local transmission</td>
<td>Alert Level 2</td>
<td>03/16/2020</td>
</tr>
<tr>
<td>Stage 3: Government action and shifts in public behavior. Not all affected regions enter stage 3, but interventions and economic impacts signal prolonged recovery</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Stage 4: Case growth and stretched health systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 5: New cases drop, activity resumes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Economic/policy indicators

<table>
<thead>
<tr>
<th>Number of airlines suspending service to country</th>
<th>Traffic congestion</th>
<th>School closures</th>
</tr>
</thead>
<tbody>
<tr>
<td>x9</td>
<td></td>
<td>Country-wide</td>
</tr>
</tbody>
</table>

Source: WHO Situation Reports, TomTom traffic index, Baidu QianXi, CDC, IATA, BBC, NYT, Japan Times, NPR, Reuters, press research
## Current phase

| Stage 1: Small number of cases identified; no sustained local transmission |
| Stage 2: Disease spread and sustained local transmission |
| Stage 3: Government action and shifts in public behavior. Not all affected regions enter stage 3, but interventions and economic impacts signal prolonged recovery |
| Stage 4: Case growth and stretched health systems |
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### Epidemiological Indicators

<table>
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<th>Total number of cases</th>
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<th>5-day new case trend</th>
<th>Crude case fatality ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>01/31</td>
<td>21,157</td>
<td>20,029</td>
<td>2,651 2,547 3,497</td>
<td>6.8%</td>
</tr>
<tr>
<td>France</td>
<td>01/25</td>
<td>4,469</td>
<td>4,369</td>
<td>372 495 591 780 829</td>
<td>2.0%</td>
</tr>
<tr>
<td>Germany</td>
<td>01/28</td>
<td>3,795</td>
<td>3,738</td>
<td>157 274 802 693 733</td>
<td>0.2%</td>
</tr>
<tr>
<td>Spain</td>
<td>02/01</td>
<td>5,753</td>
<td>5,708</td>
<td>615 501 825 1,266 1,322</td>
<td>2.4%</td>
</tr>
<tr>
<td>Rest of region</td>
<td>01/29</td>
<td>9,900</td>
<td>9,754</td>
<td>977,192 1,125 2,086 2,222</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

### Economic/policy indicators

<table>
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<th>Number of countries/territories restricting travel</th>
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<th>Traffic congestion</th>
<th>School closures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>94</td>
<td>18</td>
<td>74</td>
</tr>
<tr>
<td>France</td>
<td>55</td>
<td>10</td>
<td>74</td>
</tr>
<tr>
<td>Germany</td>
<td>52</td>
<td>45</td>
<td>56</td>
</tr>
<tr>
<td>Spain</td>
<td>49</td>
<td>5</td>
<td>59</td>
</tr>
<tr>
<td>Rest of region</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CDC travel health notice

- **Warning Level 3**
- **Alert Level 2**
- **None**

### Traffic congestion

- **03/16/2019**
- **03/16/2020**

Source: WHO Situation Reports, TomTom traffic index, Baidu QianXi, CDC, IATA, BBC, NYT, Japan Times, NPR, Reuters, press research
## Americas

### Example country

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<tr>
<th>Country</th>
<th>Date of initial case</th>
<th>Total number of cases</th>
<th>New cases in last 14 days</th>
<th>Crude case fatality ratio</th>
<th>Peak case count observed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>01/23</td>
<td>1,678</td>
<td>1,616</td>
<td>2.4%</td>
<td>N</td>
</tr>
<tr>
<td>Rest of region</td>
<td>01/27</td>
<td>699</td>
<td>677</td>
<td>0.7%</td>
<td>N</td>
</tr>
</tbody>
</table>

### Epidemiological Indicators

- **5-day new case trend**
  - US: 224, 291, 277, 414, 0
  - Rest of region: 49, 16, 105, 245

### Economic/policy indicators

- **Number of airlines suspending service to country**
  - US: 28
  - Rest of region: 59

- **Traffic congestion**
  - US: 59
  - Rest of region: 16

- **School closures**
  - US: Local

### Current phase

- **Stage 1:** Small number of cases identified; no sustained local transmission
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- **Stage 4:** Case growth and stretched health systems
- **Stage 5:** New cases drop, activity resumes

### CDC travel health notice

- **Warning Level 3**
  - 03/16/2019

- **Alert Level 2**
  - 03/16/2020

- **None**

Source: WHO Situation Reports, TomTom traffic index, Baidu QianXi, CDC, IATA, BBC, NYT, Japan Times, NPR, Reuters, press research
### South-Asia (ex-China)

#### Example country

<table>
<thead>
<tr>
<th>Country</th>
<th>Date of initial case</th>
<th>Total number of cases</th>
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<th>5-day new case trend</th>
<th>Crude case fatality ratio</th>
<th>Peak case count observed</th>
<th>Number of countries/territories restricting travel</th>
<th>Number of airlines suspending service to country</th>
<th>Traffic congestion</th>
<th>School closures</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea</td>
<td>Prior to 01/20</td>
<td>8,162</td>
<td>4,426</td>
<td>242 114 110 107 76</td>
<td>0.9%</td>
<td>N</td>
<td>86</td>
<td>x 13</td>
<td>Data N/A</td>
<td>Country-wide</td>
</tr>
<tr>
<td>Japan</td>
<td>Prior to 01/20</td>
<td>780</td>
<td>541</td>
<td>54 52 55 41 64</td>
<td>2.8%</td>
<td>N</td>
<td>48</td>
<td>x 13</td>
<td>63</td>
<td>Country-wide</td>
</tr>
<tr>
<td>Singapore</td>
<td>01/24</td>
<td>212</td>
<td>110</td>
<td>5 12 9 13 12</td>
<td>0%</td>
<td>N</td>
<td>42</td>
<td>x 13</td>
<td>59</td>
<td>Not noted</td>
</tr>
<tr>
<td>Rest of region</td>
<td>Prior to 01/20</td>
<td>1,033</td>
<td>906</td>
<td>87 61 30 206 241</td>
<td>1.1%</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

#### Current phase

- **Stage 1**: Small number of cases identified; no sustained local transmission
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- **Stage 5**: New cases drop, activity resumes

**CDC travel health notice**
- Warning Level 3
- Alert Level 2
- None

**Traffic congestion**
- 03/16/2019
- 03/16/2020

Source: WHO Situation Reports, TomTom traffic index, Baidu QianXi, CDC, IATA, BBC, NYT, Japan Times, NPR, Reuters, press research
References

COVID-19 Leading indicator dashboard for China
1. Case fatality ratio calculated as (deaths on day X) / (cases on day X). Previous versions of this dashboard calculated CFR = (deaths on day X)/(cases on day X-7) to account for incubation.
2. Measures movement of population into destinations as of 3/15/2020
3. Wuhan included only for comparison
4. 7-day average (9-Mar to 16-Mar) compared to 2019
5. Car traffic only. Congestion reflects % increase in travel time compared to free-flow conditions
Note: All countries and regions have documented third-generation cases

Region-specific details
1. Case fatality rate calculated as (deaths on day X) / (cases on day X). Dashboards before February 29 calculated CFR as (deaths on day X)/(cases on day X-7) to account for incubation.
2. Assessment based on observed stoppage in growth of cases and medical community's opinion validated by external sources
3. Anecdotal reports of airline suspensions based on press searches
5. 0 new reported cases in US on 3/15 likely a reporting anomaly and not indicative of overall trend
6. Crude case fatality ratio likely to fall as testing becomes more widely available
7. Epidemiological data current as of 3/15 WHO Situation Report
Note: All countries or regions have documented third-generation cases