• **COVID-19 is, first and foremost, a humanitarian challenge.** COVID-19 has affected communities on multiple continents, with over 2,800 deaths out of over 82,000 reported cases. To date, Wuhan and Hubei province have been the most affected locations. Thousands of health professionals are heroically battling the virus, putting their own lives at risk. Overstretched health systems mean that Wuhan and Hubei will need time and help to return to a semblance of normalcy.

• **Solving the humanitarian challenge is the top priority.** Much remains to be done globally to respond and recover, from counting the humanitarian costs of the virus, to supporting the victims and families, to developing a vaccine.

• **This document is meant to help with a narrower goal: provide facts and insights on the current COVID-19 situation to help decision-makers understand best practices.** In addition to the humanitarian challenge, there are implications for the wider economy, businesses, and employment. This document sets out some of those challenges and how organizations can respond in order to protect their people and navigate through an uncertain situation.
Executive summary (February 28, 2020)

COVID-19 passed an inflection point this week, with more new cases outside China than in China for the first time. New cases increased ~4.5x outside China, while those in China decreased ~3x compared to the previous week. However, China still reported more than 3,000 new cases, demonstrating that the epidemic is not over for them.

The global surge reflects a new inflection point in this epidemic. Four ‘major transmission complexes’ (i.e., China, East Asia, Middle East, Europe) are now active, with the US at a tipping point. Governments globally are preparing for broader spread. Outside of China, deep economic connections and people movements within these complexes will make it difficult to stop intra-complex transmission – even as individual regions go under lockdown, there are likely to be continued instances of viral “leakage”. This likelihood is enhanced by the disease’s inherent high transmissibility. Additional spread that creates new complexes is being considered an inevitability by governments around the world. The U.S. CDC, for example, has set clear expectations that the virus will appear there with community transmission. Scenarios to consider:

[BASE CASE SCENARIO] Continued spread within established complexes plus community transmission in new complexes drives ~0.3-0.7% reduction in 2020 global GDP growth

- China continues on its path to recovery, achieving a near-complete economic restart by mid-Q2
- East Asia, Middle East, and Europe see continued case growth until early Q2. This drives each region to go under various forms of lockdown (e.g., self-imposed, company-imposed, mandated by local governments), in an attempt to stop or slow down the spread. The lockdown drives a sharp reduction in demand, which in turn drives lower economic growth that lasts through Q2 and early Q3. Demand recovery depends on whether case growth reduces as a result of seasonality, or if fatality levels are low enough, where the general public resumes daily activities.
- Complexes that have not yet seen sustained case growth (e.g., Americas) see localized transmission. Greater awareness of COVID-19, plus additional time to prepare, may help these complexes manage case growth. However, complexes with less robust health systems could see more general transmission, and bear the brunt of economic impact in early Q2
- The impact on demand slows down growth of the global economy – between 1.8-2.2% instead of the 2.5% growth envisioned at the start of the year. Sectors are impacted differently – certain sectors (e.g., aviation, tourism, hospitality) see lower demand for a longer duration. For others (e.g., consumer goods), demand is initially lower but expected to rebound quickly

[CONSERVATIVE SCENARIO] COVID-19 sees generalized, global spread through 2020, resulting in a demand shock that lasts for most of the year. In this scenario, the virus would not show significant seasonal effects, or result in far higher transmissibility (e.g., through asymptomatic transfer), before health systems can detect and respond to it effectively at scale

Companies are still assessing the full impact of disruptions as COVID-19 continues to spread. Companies with strong, centralized procurement teams and good supplier relationships are feeling more confident in the visibility and supply risk (Q2+); but many companies are still grappling with their exposure on China and other transmission complexes. Given the relatively quick economic restart in China, many companies are focused more on temporary stabilization (e.g., parts rationalization, demand plan updates driving new product/sku plans, booking logistic capacity, other), rather than alternative suppliers outside China. Companies are, however, making strategic, longer-term moves that they were considering – with the COVID-19 outbreak as an accelerant

Given the rapid spread, companies could consider the following actions:

- Protect employees: Follow the most conservative guidelines among leading global and local health authorities (e.g., CDC, WHO). Communicate with employees frequently on decisions made, support any impacted employees per health guidance. Benchmark efforts in terms of workplace actions
- Stand-up a cross-functional, global COVID-19 response team: Designate lead at the C-suite/CEO-1 level. Appoint 5 workstreams focused on (a) employees, (b) financial stress-testing and contingency plan, (c) supply chain, (d) customers; and (e) other relevant constituencies
- Protect customers: Protect customers (e.g., no penalties for cancellations, waiving fees); preserve customer loyalty (e.g., premium discounts); pursue online strategy as means of outreach
- Stress-test financials and liquidity, and create contingency plan: Model cash flow, P&L, balance sheet in each scenario; identify input variable triggers that could drive significant liquidity events (incl. breach of covenants). Identify critical operations, employees. Create pragmatic, trigger-based contingency plans. Conduct table-top exercises with top team
- Maintain supply chain: Define extent and timing of Tier 1 / 2+ exposure. Pursue immediate stabilization (e.g., critical parts rationalization, pre-book freight capacity, plan for restart). Plan for how to manage a supply market with unusual spikes in demand, as supply comes back
- Demonstrate purpose: Support epidemic efforts where possible


McKinsey and Company
COVID-19
Latest epidemiological information as of February 27, 2020

Impact to date

- >82,000 Reported confirmed cases
- 2,800+ Deaths
- 47 Countries affected
- ~1/2 Proportion of affected countries with new cases in the last 7 days
- 18 Countries with any evidence of community transmission (Highest: China, S. Korea, Italy, Iran, Japan, Singapore)
- 8 Countries with more >50 reported cases
- 55% New reported cases are in China in the last 7 days

Features of disease to date

- 1.5-2x Higher transmission compared to the flu
- Up to 20% Patients have severe disease
- <1/40 Patients die; fatality rates are significantly lower outside Hubei

Comparison to other diseases

<table>
<thead>
<tr>
<th>Reproduction number</th>
<th>Case fatality ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (&gt;4)</td>
<td>Low (&lt;2%)</td>
</tr>
<tr>
<td>Medium (2-4)</td>
<td>Medium (2-15%)</td>
</tr>
<tr>
<td>Low (&lt;2)</td>
<td>High (&gt;15%)</td>
</tr>
</tbody>
</table>

The average number of individuals infected from each infected individual

Identification of cases early in the disease (i.e., with fewer symptoms), intensification of viral control methods, and deployment of treatments (when available) will drive down the reproduction number and reduce case fatality

Global considerations

- Numbers of affected countries has risen significantly with >35 countries with new cases in the last 7 days
- Community transmission suspected in at least 18 countries, with >50 cases: South Korea, Japan, Singapore, and Italy – a number of cases are still under investigation to identify source of infection
- Oversight is intensifying in weaker health systems less capable of handling outbreak

China (outside Hubei)

- Daily incremental case count remains low for the last 7 days; <1 reported cases per million
- The number of confirmed cases reported is generally trending down

Source: World Health Organization

1. Latest numbers are available from a number of sources, including daily situation reports from the World Health Organization
2. Evidence on exact numbers are emerging, however expected to decrease as viral containment measures intensify and treatments are developed
3. Case fatality numbers are reflective of the outbreak setting and depend on a number of factors, including patient's age, community immunity, health system capabilities, etc. This graphic aims to offer a broad comparison.
4. Excluding cruise ship
5. In outbreak setting or at the beginning of the introduction of a new disease
COVID-19 is spreading globally and governments are responding

A rising number of countries show evidence of community transmission

Governments worldwide are reacting with different measures

Selected measures along the global regions

**East Asia**
- South Korea declared highest level threat “red alert”, closed schools and created “rapid response teams” for cluster investigation
- Several countries partially closed borders (e.g., Armenia, Afghanistan, Iraq, Turkey, Pakistan)

**Middle East**
- Iran closed schools, universities and cultural centers
- Several countries partially closed borders (e.g., Armenia, Afghanistan, Iraq, Turkey, Pakistan)

**Africa**
- WHO helped to train >11,000 African health workers and shipped >30,000 sets of personal protective equipment

**Europe**
- Italy signed an order issuing a ban to leave or access affected areas, suspension of demonstration and all kinds of events, suspension of childcare and school education and quarantine for people in contact

**America**
- USA implemented mandatory quarantine, airport screenings, partial travel restriction, repatriation flights from areas with substantial COVID-19 transmissions and stocked up on masks; general public announcement made on need for preparedness

As the situation is evolving, we are learning more about the disease – a number of unknowns remain

**Disease characteristics**

- **Reproduction number**
  - Reports from Cruise ship
  - Calculations from academic publications (e.g., Nature, Imperial, NEJM, Lancet)

- **Asymptomatic infection rate**
  - Reports from Cruise ship
  - Calculations from academic publications (e.g., Nature, Imperial, NEJM, Lancet)

**Implications**

- Transmissibility is expected to be less as outbreak evolves and cases are identified early (+ treatments / vaccines emerge)
- High uncertainty surrounding asymptomatic infection rate due to missing data/evidence
- High rates of asymptomatic infections warrants additional measures beyond traditional screening

**Case fatality estimates**

- Calculations for countries with >50 cases based on reported cases and deaths

1 This is not a standard epidemiological measure - it is meant to reflect some of the ongoing challenges in tracking the evolution of the disease; it does not correspond to Case fatality ratio, which requires better of understanding of number of cases at the time of infection vs. death;
Wuhan and Hubei continue to be deeply impacted...

The epicenter of the outbreak is facing emergency conditions and will need time to return to normalcy

Humanitarian toll and economic impacts are high

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>~59M</strong></td>
<td>Individuals under quarantine</td>
</tr>
<tr>
<td><strong>200+</strong></td>
<td>New confirmed cases daily&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>1,700</strong></td>
<td>Health worker infections</td>
</tr>
<tr>
<td><strong>March 10</strong></td>
<td>Continued shutdown of businesses in Hubei province&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

A large effort has been underway to regain control...<sup>3</sup>

- 46 designated hospitals
- ~20,000 beds devoted to virus care
- Converted stadiums, office buildings, schools providing additional beds
- 30,000+ medical staff from across China have come to Wuhan to provide support

...but Wuhan and Hubei will need time to return to normalcy

- **Infection rates remain high** – Hubei has had between 200-800 infections every day for the last 5 days – far higher than 50-100 for the rest of China combined
- **Fatality rates are more than 3 times higher in Hubei** relative to the rest of China – indicative of a stretched medical system and / or changing virus characteristics
- Once these measures are under control, Hubei will need time to **lift the quarantine, disinfect and restart safely**

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1. Refers to reported cases using new confirmed case definition, including clinical feature and laboratory-confirmed, latest available information available from a number of sources
2. As per Bloomberg, companies engaged in supply chain production
3. Latest update from 2/27/2020

Source: Bloomberg, World Health Organization, Chinese press reports
...but February 24th represented an inflection point for COVID-19
Whereas case growth will still fluctuate, outside China exceeded in-China cases for the first time

CURRENT AS OF FEBRUARY 27, 2020

Source: Korean Center for Disease Control and Prevention, Yonhap News, Italian Government Law 23 February 2020, n. 6, Singaporean Ministry of Health, European Centre for Disease Prevention and Control, World Health Organization World Health Organization Situation Reports, February 13th to 27th

1. Refers to sustained in-country transmission, not linked to epicenter of outbreak (Wuhan) or affected travelers from affected regions

Example of countries with confirmed community transmission

<table>
<thead>
<tr>
<th>Country</th>
<th>Confirmed cases</th>
<th>Death cases</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea</td>
<td>1766</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>Japan</td>
<td>186</td>
<td>3</td>
<td>Measures implemented by the Japanese government:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Travel restrictions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Postponing preparations for the Tokyo 2020 Summer Olympics (e.g., Volunteer training)</td>
</tr>
<tr>
<td>Italy</td>
<td>400</td>
<td>12</td>
<td>Measures implemented by the Italian government:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Schools and universities closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Public Events stopped (e.g., Venice carnival)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Towns under full quarantine with curfew</td>
</tr>
<tr>
<td>Singapore</td>
<td>93</td>
<td>0</td>
<td>Measures implemented by the Singaporean government:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Travel restrictions (e.g., air borders closed with mainland China)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- School policies implemented (e.g., no assemblies)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Policies to limit profiteering in place (e.g., price increase of surgical masks)</td>
</tr>
<tr>
<td>Iran</td>
<td>141</td>
<td>22</td>
<td>Measures implemented by the Iran government:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Schools, universities and cultural centers closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Surrounding countries responded with border closure (e.g., Armenia, Afghanistan, Iraq)</td>
</tr>
</tbody>
</table>

1. Reported confirmed cases in the last 14 days

Start of global new reported cases beginning to outpace China reported cases

Daily incremental reported cases

- China
- Ex-China

Reported deaths

- Reported confirmed cases
- Reported cases in the last 14 days
- Reported deaths

Measures implemented by the South Korean government:
- Closure of schools
- Reduced travel operations
- Rapid response team for cluster investigation (e.g., linked to a religious group)

Measures implemented by the Italian government:
- Schools and universities closed
- Public Events stopped (e.g., Venice carnival)
- Towns under full quarantine with curfew

McKinsey and Company
There are now 4 established COVID-19 transmission complexes to monitor globally
A complex combines confirmed community transmission with tough-to-prevent people movement

Four complexes around the world where COVID-19 is now confirmed. Deep economic integration and regular human and material movements mean that it will be tough to limit virus propagation within these complexes

**China complex:** Mature propagation
Disease continues to impact Hubei, but stringent public health measures (and the ability to enforce them more comprehensively) has meant that cases in the rest of China are low (under 100 cases/day), and trending down in spite of measured economic activity restart

**East Asia complex:** Early propagation
Multiple countries with strong health care systems are seeing sustained community propagation (South Korea, Japan, Singapore). Concerns around “case leakage” (i.e., lack of confidence that every possible transmission has been identified and is being treated) are persisting. While emergency measures are being placed, the ability of these countries to have a comprehensive quarantine is limited

**Middle East complex:** Early propagation
Iran is closely connected to its neighboring countries (e.g., Iraq, Syria, Afghanistan, Yemen) with frequent people and material movement across porous borders. Significant case count growth with new confirmed cases across many countries stemming from Iran

**Western Europe:** New propagation
Italy represents the first European case of sustained community transmission. While quarantine is being attempted across Northern Italy, new cases are emerging across Europe. Any sustained quarantine will prove challenging to execute. Effective clampdown on cross-border people movement is politically and economically difficult

**Africa complex:** No reported propagation
While we have no evidence that the virus is circulating in Africa, health experts globally continue to be concerned about the possibility of an outbreak on the continent, partially because travel hubs connecting into China (e.g., Addis Ababa) continue to operate throughout the period of propagation of the virus

**America complex:** No reported propagation
While the US documented their first case of community transmission in the last week, a number of 2nd generation cases have emerged in the Americas. Ability to contain these imported cases will determine activity of cluster over the next weeks
COVID-19 propagating in countries that represent 32% of global GDP

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP (Tn)</th>
<th>% of global</th>
<th>Case counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>13.61</td>
<td>16.1</td>
<td>78,630</td>
</tr>
<tr>
<td>South Korea</td>
<td>1.62</td>
<td>1.9</td>
<td>1766</td>
</tr>
<tr>
<td>Italy</td>
<td>2.08</td>
<td>2.5</td>
<td>400</td>
</tr>
<tr>
<td>Japan</td>
<td>4.97</td>
<td>5.9</td>
<td>186</td>
</tr>
<tr>
<td>Singapore</td>
<td>0.36</td>
<td>0.4</td>
<td>93</td>
</tr>
<tr>
<td>Iran</td>
<td>0.45</td>
<td>0.5</td>
<td>141</td>
</tr>
<tr>
<td>Germany</td>
<td>3.95</td>
<td>4.7</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>27.04</strong></td>
<td><strong>32</strong></td>
<td>~82,000</td>
</tr>
</tbody>
</table>

1. Defined as countries showing at least 10 cases of in-country transmission

Source: World Bank Data, World Health Organization

Even limited propagation within the Europe complex (e.g., to France, Germany), and concern around “case leakage” could cause large behavior changes by governments, firms, and individuals (e.g., curtailment of travel)

Regardless of the precise clinical situation, such actions could easily drive a global economic impact that takes longer to recover from relative to previous estimates.
## COVID-19 Leading Indicator Dashboard

Propagation of COVID-19 across new transmission complexes

1. Calculated as Total Deaths / Total cases Today – 7 days; 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; 4. Based on representative cities, Tokyo, Singapore, Milan, and Tel Aviv

### Epidemiological Indicators

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Representative country</th>
<th>Current phase</th>
<th>Date of initial case</th>
<th>Documented 3rd gen case</th>
<th>Total number of cases</th>
<th>Number of new cases in last 14 days</th>
<th>Prior 3 days</th>
<th>Last 3 days</th>
<th>Case fatality ratio¹</th>
<th>Peak case count observed?²</th>
<th>Case growth/shift in public behavior</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest of Asia (ex-China)</td>
<td>South Korea</td>
<td>Red</td>
<td>Prior to 01/20</td>
<td>Y</td>
<td>1,766</td>
<td>1,738</td>
<td>204 763</td>
<td>763 1,766</td>
<td>13%</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td>Yellow</td>
<td>Prior to 01/20</td>
<td>Y</td>
<td>186</td>
<td>157</td>
<td>93 144</td>
<td>144 186</td>
<td>4%</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
<td>Yellow</td>
<td>01/24</td>
<td>Y</td>
<td>93</td>
<td>43</td>
<td>85 89</td>
<td>89 93</td>
<td>0%</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Europe</td>
<td>Italy</td>
<td>Red</td>
<td>01/31</td>
<td>Y</td>
<td>400</td>
<td>397</td>
<td>3 124</td>
<td>124 400</td>
<td>TBD</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Middle East</td>
<td>Iran</td>
<td>Red</td>
<td>02/20</td>
<td>Y</td>
<td>141</td>
<td>141</td>
<td>5 43</td>
<td>43 141</td>
<td>TBD</td>
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<tr>
<td>Israel</td>
<td>Brazil</td>
<td>Grey</td>
<td>02/24</td>
<td>N</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>0 1</td>
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<td>N</td>
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<tr>
<td>LATAM</td>
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<td>Grey</td>
<td>02/27</td>
<td>N</td>
<td>1</td>
<td>1</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>Phase 2:</td>
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</tr>
</tbody>
</table>

### Compound daily growth in cases

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Represented country</th>
<th>Current phase</th>
<th>Date of initial case</th>
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<td>1</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
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</tr>
</tbody>
</table>

### Economic / policy indicators

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Represented country</th>
<th>Current phase</th>
<th>Date of initial case</th>
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</tr>
<tr>
<td>Japan</td>
<td></td>
<td>Yellow</td>
<td>Prior to 01/20</td>
<td>Y</td>
<td>186</td>
<td>157</td>
<td>93 144</td>
<td>144 186</td>
<td>4%</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
<td>Yellow</td>
<td>01/24</td>
<td>Y</td>
<td>93</td>
<td>43</td>
<td>85 89</td>
<td>89 93</td>
<td>0%</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Europe</td>
<td>Italy</td>
<td>Red</td>
<td>01/31</td>
<td>Y</td>
<td>400</td>
<td>397</td>
<td>3 124</td>
<td>124 400</td>
<td>TBD</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Middle East</td>
<td>Iran</td>
<td>Red</td>
<td>02/20</td>
<td>Y</td>
<td>141</td>
<td>141</td>
<td>5 43</td>
<td>43 141</td>
<td>TBD</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>Israel</td>
<td>Brazil</td>
<td>Grey</td>
<td>02/24</td>
<td>N</td>
<td>2</td>
<td>2</td>
<td>N/A</td>
<td>0 1</td>
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<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
<tr>
<td>LATAM</td>
<td></td>
<td>Grey</td>
<td>02/27</td>
<td>N</td>
<td>1</td>
<td>1</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
</tbody>
</table>

### Traffic congestion levels

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Represented country</th>
<th>Current phase</th>
<th>Date of initial case</th>
<th>Documented 3rd gen case</th>
<th>Total number of cases</th>
<th>Number of new cases in last 14 days</th>
<th>Prior 3 days</th>
<th>Last 3 days</th>
<th>Case fatality ratio¹</th>
<th>Peak case count observed?²</th>
<th>Case growth/shift in public behavior</th>
<th>Documentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest of Asia (ex-China)</td>
<td>South Korea</td>
<td>Red</td>
<td>Prior to 01/20</td>
<td>Y</td>
<td>1,766</td>
<td>1,738</td>
<td>204 763</td>
<td>763 1,766</td>
<td>13%</td>
<td>N</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
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<td>TBD</td>
<td>TBD</td>
<td>Phase 2:</td>
<td>Represented</td>
</tr>
</tbody>
</table>

### Pre-phase 1: Small number of cases identified; no sustained community transmission

### Phase 1: Disease start and sustained community transmission

### Phase 2: Government action / shift in public behavior. Not all affected regions enter phase 2, but significant gov. intervention / economic impacts signal prolonged recovery

### Phase 3: Case growth / stretched health systems

### Phase 4: New case drop, activity resumption

### Source:

- WHO Situation Reports
- CDC travel notice
- IATA
- Reuters
- TomTom traffic index
- press searches
COVID-19 Leading Indicator Dashboard – China-specific

Currently tracking towards restart in China

Hubei impact

How deeply is Hubei (esp. Wuhan) impacted, and when could economic activity restart?

- **Late Q2**: Hubei remains deeply impacted. Return to economic activity tough to foresee until mid Q2

Hubei epidemiological status

- Latest daily infection rate (per million):<br>  - **Hebei**: <0.1<br>  - **China other (avg.)**: <100X<br>  - **Fatality ratio**: <1%

Hubei recovery milestones to watch

- **Rate of confirmed cases consistently decreasing**:<br>  - New suspected / confirmed cases rate consistent with other provinces<br>  - Quarantine lifted<br>  - No additional spikes in case count<br>  - Public transport resumes<br>  - Factory activity return to pre-outbreak levels

CN economic restart

How quickly could economic activity restart in China (ex-Hubei)?

- **Late Q1**: Restart (ex-Hubei) has begun, but faces challenges – from worker shortage to movement of goods with larger companies witnessing higher business resumption rate.<br>  - Most activity likely to return late Q1

Labor availability (Inbound movement of population to major industrial provinces in China)²

- 2/26/2020 vs. Same day 2019:
  - Jiangsu: 8 vs. 11
  - Shandong: 3 vs. 6
  - Zhejiang: 11 vs. 8
  - Guangdong: 17 vs. 10

Resuming status of “Above Designated Size” industrial enterprises

- Jiangsu: 96% (90% near fully recovered)
- Shandong: 90% (>50% recovery progressing)
- Zhejiang: 100% (>80%, near fully recovered)
- Guangdong³: 82% (<50%, recovery slow)

Small businesses are facing more challenges from labor disruption – fewer workers returning to work, per reports – % resumption significantly lower based on reports

CN consumer confidence

How quickly will Chinese consumer confidence and purchasing activity return?

- **Early Q2**: In-China consumer spend may lag a few weeks behind economic restart. Certain sectors (e.g., tourism) impacted well into Q2

City congestion level in major cities in China⁴

- 2/27/2020 vs. Same day 2019:
  - Shenzhen: 33% vs. 63%
  - Beijing: 22% vs. 67%
  - Shanghai: 29% vs. 57%
  - Nanjing: 43% vs. 55%
  - Wuhan: 8% vs. 48%

Earliest school restarts in China at province level

- Started with online lessons: Shandong
- Beginning of March: Jiangsu
- TBD: Beijing, Shanghai, Nanjing

Example consumer behavior metrics [anecdotal]

- 92% decline: Retail sales of passenger car in 1H February⁵
- 37% decline: Smartphone sales in January⁶
- Down 56%: Consumer spending on food and drinks in Jan and Feb⁶
- 80% decline: Hotel occupancy 2H Jan and 1H February⁶


¹ Total deaths / total cases t-7 days to account for lag in final outcome of disease; ² Measures movement of population into destinations as of 2/26/2020; ³ Latest data from Guangdong as of 2/22, Shandong as of 2/23, Zhejiang as of 2/25, and Jiangsu as of 2/24; ⁴ Car traffic only. Congestion level measures % increase in travel time compared to free flow condition; ⁵ Year over year comparison
Three scenarios for how COVID-19 could evolve
Scenarios for stress testing and contingency planning – what you have to believe

### Quick recovery

- **Ex-Hubei China** economic restart >80% relative to pre-outbreak levels, with large industrials leading while small-medium enterprises slower
- Hubei starts to return to normalcy in March; result of a large-scale health response having an effect
- Community transmissions in East Asia (South Korea, Japan, Singapore) and Europe (Italy, etc.) are brought under control
- Community transmissions in Middle East are controlled
- Consumer confidence starts to return, even in setting of community transmissions, due to lower case fatality ratio, case growth slowdown, promising treatment options; consumer demand persists, especially in certain sectors (e.g., food, necessities via online channels)
- Cases peak in multiple regions; evidence mounts that the virus is not resilient to seasonality
- Aviation, tourism, hospitality sectors back to normal as countries lift travel bans

### Global slowdown (BASE CASE)

- Continued path to recovery in China. Ex-Hubei China economic restart >80% relative to pre-outbreak levels, with large industrials leading while small-medium enterprises slower
- Moderate decline in private consumption and exports of services
- China at near-complete economic restart by Q2. Hubei is back to normalcy, a result of a large-scale health response and containment measures having an effect
- East Asia, Middle East, and Europe see continued case growth, contributing to perception of "leakage," impacting economic growth in all three regions. Each goes into lockdown, either government, company, or self-imposed. Early Q2 is the first time they see a reduction in new cases in certain complexes.
- Consumer confidence dampened through Q2 and potentially Q3. Demand recovery depends on evolution of disease, considering potential impact of seasonality, fatality levels
- Impact and recovery differs by sector – e.g., aviation, tourism, hospitality sectors longer to rebound than consumer goods

### Global pandemic and recession

- Ex-Hubei China economic restart >80% relative to pre-outbreak levels, with large industrials leading while small-medium enterprises slower
- Hubei starts to return to normalcy, a result of a large-scale health response and containment measures having an effect
- Generalized, global spread – East Asia, Middle East, and Europe transmission complexes all see continued case growth until mid-Q2, potentially with less robust health / containment response; mid-to-late Q2 is the first time they see a reduction in new cases
- COVID-19 resistant to seasonal effect, or results in higher transmissibility, before health systems can detect and react effectively at scale; continues to expand to other parts of the world
- Substantial demand shock that lasts through bulk of year – fall in private consumption, level of exports and services, financial market "contagion"
- Consumer confidence remains anemic, although certain sectors might recover earlier; air travel restrictions remain in place until late 2020

- Transmission jumps, new complexes. Global pandemic drives a recession that lasts bulk of the year

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CURRENT AS OF FEBRUARY 27, 2020
All sectors are impacted, with several seeing more severe consequences through Q2 2020 through the rest of the year

Preliminary views based on base case – Subject to change as the COVID-19 outbreak evolves

<table>
<thead>
<tr>
<th>Estimated degree of impact, in terms of duration</th>
<th>Tourism and hospitality</th>
<th>Aviation / airlines</th>
<th>Automotive</th>
<th>Oil and gas</th>
<th>Consumer products</th>
<th>Consumer electronics and semi-conductors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longest</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimated global restart</th>
<th>Q4</th>
<th>Late Q3 / early Q4</th>
<th>Q3</th>
<th>Q3</th>
<th>Q2</th>
<th>Q2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Travel slowdown to and from major Asian travel hubs (20%+ YoY decrease) and select European destinations (e.g., France), coupled with decrease in Chinese tourism spend ($277Bn, 16% of international tourism spend in 2019), likely to reduce demand globally (up to 40% decline 2020 output) until disease is “under control” across transmission complexes, likely far into Q4</td>
<td>Emergence of new sites of community transmission (e.g., Iran, South Korea) likely to compound existing losses incurred by Asia-Pacific carriers. Travel restrictions, drop in consumer confidence, corporate policies to limit mass gatherings and non-essential travel are acutely impacted industry</td>
<td>Impact across airlines to vary, with smaller airlines with low margins and smaller cash reserves more at risk, but larger global network at risk is suggesting much broader, prolonged slowdown</td>
<td>Signs of ongoing disease expansion in Europe (2nd largest global automotive producer, 6.1% of total EU employment) to amplify impact, despite ongoing Chinese economic restart. Likely to compound existing market vulnerabilities (e.g., trade tensions, declining sales)</td>
<td>Headwinds faced likely to persist into Q3 given tight inventories (fewer than 6 weeks) and complex supply chains (and thereby minimal ability to shift supply chains)</td>
<td>Global slowdown in demand to improve and consumer confidence to recover when disease is perceived “under control” – seeing sustained demand in China (e.g., express delivery, food delivery, though hampered by labor shortage)</td>
</tr>
<tr>
<td></td>
<td>Several EU and APAC countries are highly dependent on tourism (7-20% of national GDP)</td>
<td>As with tourism, expected recovery to be faster for domestic travel (~2 quarters), longer for international (~3-4 quarters), if not longer based on disease evolution</td>
<td>Impact across airlines to vary, with smaller airlines with low margins and smaller cash reserves more at risk, but larger global network at risk is suggesting much broader, prolonged slowdown</td>
<td>Tourism and hospitality could proactively protect and prepare its people, anticipate near-term fall in demand, prepare to manage reputational risk and review annual planning in anticipation of long-term impacts</td>
<td>Crime and natural disaster could impact government stimulus strategy (e.g., postponing employee benefit payments)</td>
<td>Global slowdown in demand to improve and consumer confidence to recover when disease is perceived “under control” – seeing sustained demand in China (e.g., express delivery, food delivery, though hampered by labor shortage)</td>
</tr>
</tbody>
</table>

Key insights

- Travel slowdown to and from major Asian travel hubs (20%+ YoY decrease) and select European destinations (e.g., France), coupled with decrease in Chinese tourism spend ($277Bn, 16% of international tourism spend in 2019), likely to reduce demand globally (up to 40% decline 2020 output) until disease is “under control” across transmission complexes, likely far into Q4
- Several EU and APAC countries are highly dependent on tourism (7-20% of national GDP)
- Hospitality sector could proactively protect and prepare its people, anticipate near-term fall in demand, prepare to manage reputational risk and review annual planning in anticipation of long-term impacts

Source: IHS Market; McKinsey Global Institute Analysis; Press reports
### Cross-sector impacts due to logistics challenges

**COVID-19's impact on logistics have global repercussions that will likely persist through the end of the year**

**Overview**

Global logistics market (transportation, inventory management, warehousing, order processing, and other supply chain activities) accounts for ~$8-12Tn USD, representing ~12% of global GDP

- **Modes of transportation** (road, rail, air, and sea freight) and represent ~$4-5Tn
- **Asia Pacific** constitutes largest component of global logistics (~45% market revenue)

Today, we are more connected with and reliant on China in trade than in 2003 (SARS). Global trade has increased from $7.6Tn in 2003 to $19.6Tn in 2019

Since the initial outbreak of COVID-19, most logistics impact has been focused on China. Demand pressures, along with supply chain challenges, have led to decreasing exports as China is slowly restarting economically. The logistics industry faces a relative greater impact since unutilized capacity is lost and more acutely affects logistics companies’ bottom line. Many container shipping lines have cancelled services and are running fewer ships

Given spread of COVID-19 to new transmissions complexes to rest of Asia (see South Korea, Japan), the logistics impact on global scale will likely persist for months longer even as the sector recovers in China

Once logistics industry recovers, there may be over-supply (i.e., demand for logistics services) as other sectors recover. Logistics companies could consider a suite of actions to be prioritize and create capacity to accommodate, bouncing back quickly

**Sector-specific considerations due to COVID-19 outbreak**

- **Global maritime shipping volumes have decreased heavily from recent COVID-19 outbreak**
  - **46%** of scheduled departures on a major Asia to Europe route had been cancelled in the past four weeks as of Feb 20
  - **80%** of world goods trade by volume is carried by sea. The 9 busiest container ports in the world are in China (7), Singapore (1), and S. Korea (1)
  - **COVID-19** has led to 1.7M TEA lost in global container business as of Feb 23, equal to 1% of total global volume in 2019; global container volumes grew 0.7% in 2019, meaning the impact of COVID-19 on volumes has more than erased the full global growth seen in 2019
  - Then has resulted in ~350M USD loss in revenue per week

- **Global air freight has experienced decreased capacity driven by reduction in passenger belly capacity and labor.** Logistical constraints, increased rates due stemming from overdemand
  - **Passenger bellies** represent ~45% of all the capacity in and out of China; decreases in bellyhold from flight reductions (global air traffic estimated to have a ~5% reduction in 2020 due to COVID-19 with 70+ airlines reducing number of flights), has resulted in moderate increases in rates
  - TAC index rates from Shanghai to Europe have increased by 9% from just before the Lunar New Year.
  - Flight restrictions have led to pre-booked or over booked orders which operators can’t fulfill; especially with uncertainty around how to fulfill demand when it opens back up (e.g., air travel to and from China has been made optional with pilot unions by two major international logistical carriers, UPS and FedEx)
  - There has been an increased demand for air for urgent goods (e.g., medical supplies to support the crisis) and an increase from shippers less willing to bear delays due to strained supply chains from the prolonged shutdown.
  - The need to ramp up stock levels and given the disruptions to other modes of transport air freight rates have risen as a result. Disruptions expected through at least March.

- **Land transport velocity** has slowed down locally, in part due to both inbound and outbound volume reductions and labor shortages; this slowdown is expected to ripple globally in the next weeks and months
  - Truckers and train drivers are experiencing additional restrictions and regulations by different provinces; limiting transport and leading to a shortage of drivers and maintaining trucking staff on duty in China and trucking companies have stopped accepting new business due to labor shortage; truck availability is as low as 10-20% in certain Chinese regions
  - The slow down is causing overstocking in a number of ports, including Shanghai, Ningbo, and Xingtan
  - Rail freight has seen less disruption to date, and there has been an increased dependency on rail for long-distance transportation, provided the shipments can be transported to the nearest rail platforms that have train departures
  - While there has been an increased demand for rail, capacity is scarce, and first/last mile remains a constraint due to driver labor shortages

- **General changes in policy** have also occurred, with providers enacting stricter cancelation policies, and not accepting less than truckload (LTL) shipments – only offering full container capacity

**Looking forward**

COVID-19 Impact on global logistics will take an extended period of time to correct; ramp-up time for logistics is likely to be slower than other industries

- **Normal logistics operations not likely to return until April in China, provided the viral spread declines by then**
- **In China, freight pick-up has restarted but reports indicate wait times of 10+ days to get out of China and surcharges to get product into China**

Non-Chinese ports have not yet reported falling throughput volumes, but this may change in the next few weeks, as ships from Asia may not arrive with containers from China

Inbound container volumes at U.S. seaports projected to be down 12.9% in February from 2019 and down 9.5% in March from 2019

Tech hardware companies are shipping products to alternative production sites (e.g., shipping parts to Vietnam via air and sea)

Some airlines have started to use passenger aircraft for cargo as a temporary means to mitigate shortage in belly-hold capacity

To date, the UIIRF anticipates intermodal transport to and from Northern Italy will continue as normal; however road transport is expected to experience limitations

What logistics companies should do:

- **Work with customers to identify and understand:** key constraints that will affect planned volume work, changes in demand capacity based on operational and strategic needs
- **Be able to predict when and where capacity will be needed and allocate resources rapidly** to accommodate situational changes; consider how to create extra, surge capacity to handle uptick in demand as other sectors recover

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Source: Press reports, including Wall Street Journal, Bloomberg, The Guardian, expert interviews, Alphaliner, Factiva, IATA

McKinsey and Company 14
Actions to consider in response to COVID-19

Checklist for COVID-19 planning actions

**Protect employees**
- Follow the most conservative guidelines available among leading global and local health authorities (e.g., CDC, WHO)
- Communicate with employees frequently and with the right specificity; support any impacted employees per health guidance
- Benchmark efforts (e.g., certain companies curbing non-essential travel to all countries with community transmission)

**Stand-up a cross-functional COVID-19 response team**
- Designate overall at the C-suite/CEO-1 level; team should be cross-functional and fully dedicated
- Appoint 5 workstreams: a) employees, b) financial stress-testing and contingency plan, c) supply chain, d) marketing and sales e) other relevant constituencies
- Define specific, rolling 48-hour, 1-week goals for each workstream based on planning scenario
- Ensure a simple but well managed operating cadence and discipline. Output and decision focused. Low tolerance for “meetings for the sake of meetings”
- Deliver minimum viable products: a) Rolling 6-week calendar of milestones; b) 1-page plans for each workstream; c) dashboard of progress and triggers; d) threat map

**Workstream based goals (other than employees)**

**Financial stress-testing and contingency plan**
- Define scenarios that are tailored to the company – including global slowdown over multiple durations; identify baseline planning scenario
- Identify variables that will impact revenue and cost. For each scenario, define input numbers for each variable through analytics and expert input
- Model cash flow, P&L, balance sheet in each scenario; identify input variable triggers that could drive significant liquidity events (incl. breach of covenants)
- Identify trigger-based moves to stabilize organization in each scenario (A/P, A/R optimization; cost reduction; portfolio optimization through divestments, M&A)

**Customer care**
- Protect customers (e.g., no penalties for cancellations, waiving fees, flexible booking models)
- Preserve customer loyalty (e.g., premium discounts, loyalty packages)

**Supply Chain (deep dive on following page)**

**Marketing and Sales**
- Immediate stabilization (inventory planning, near-term pricing changes, discounts)
- Medium/longer-term stabilization (investment and micro-targeting for priority segments with long-term growth)
- Examine online vs branch strategy (e.g., in China now, no footfall traffic in major metropolitan areas but significant online demand; investing much more in digital)

**Practice plan with top team through in-depth table-top exercise.**
- Define activation protocol for different phases of response (e.g., contingency planning only, full-scale response, other)
- Key considerations: Clarity on decision owner (ideally a single leader), roles for each top team member, “elephant in room” that may slow response, actions and investment needed to carry out plan

**Demonstrate purpose**
- Support epidemic efforts where possible
Supply chain actions to consider in response to COVID-19

<table>
<thead>
<tr>
<th>Immediate (2-4 weeks)</th>
<th>Mid-term (2-4 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Understand exposure</strong></td>
<td><strong>Continuous improve material supply stability</strong></td>
</tr>
<tr>
<td>1. Determine truly critical components and understand risks of tier 1 to tier 2 suppliers onwards</td>
<td>Evaluating alternative sourcing options for all the materials impacted — availability of suppliers, additional cost due to logistics, tariffs, estimate of price increase of the components</td>
</tr>
<tr>
<td>2. Define current inventory buffer and locations(^1)</td>
<td>Enhance the demand verification process to correct inflated demand to mitigate the bullwhip effect</td>
</tr>
<tr>
<td>3. Identify origin of supply (i.e., Hubei/ Wuhan) to identify severity of risk</td>
<td>Provide continuous support the mid-small size tier 2-3 suppliers in financial troubles</td>
</tr>
<tr>
<td>4. Conduct scenario planning to understand financial and operational implications in prolonged shutdown (scenarios 2 and 3)</td>
<td>Assess regional risks for current and backup suppliers</td>
</tr>
<tr>
<td>5. Work with S&amp;OP to get 3-6 month accurate demand signal segmenting likely to be impacted demand to determine required supply</td>
<td><strong>Kick off designing resilient supply chain for the future</strong></td>
</tr>
<tr>
<td><strong>Take action to address anticipated shortages</strong></td>
<td><strong>Establish a supply chain risk function</strong></td>
</tr>
<tr>
<td>6. Look to ramp up now on alternative sources if supplies are in Hubei and accelerate exploration of additional options</td>
<td>Digitalize process and tools to integrate demand, supply, and capacity planning</td>
</tr>
<tr>
<td>7. Change mode of transportation to reduce replenishment lead-time and pre-book air freight(^2) / rail capacity as required by current exposure</td>
<td>Trigger the new supply network design for resilience</td>
</tr>
<tr>
<td>8. Optimize limited production determining highest margin and highest opportunity cost / penalty production</td>
<td>Codify the processes and tools created during the crisis management as formal documentation</td>
</tr>
<tr>
<td>9. Collaborate with all parties to jointly leverage freight capacity, new/alternate supply sources, etc.</td>
<td>Convert war room into a reliable risk management process</td>
</tr>
<tr>
<td>10. Watch for extending lead times to gauge performance and capacity against supplier promises</td>
<td><strong>Build collaborative relationship w/ ext. partners</strong></td>
</tr>
<tr>
<td>11. Use after sales stock as bridge to keep production running</td>
<td>Work with government to explore potential tax benefits</td>
</tr>
<tr>
<td>12. Work with supplier to source personal protective equipment for production lines operating in affected markets (e.g., glasses, gloves and masks)</td>
<td>Actively engage investors and other stakeholders to build transparency on the situation and get help</td>
</tr>
<tr>
<td>13. Engage with crisis communication teams to clearly communicate to employees on infection risk concerns (e.g., disseminate facts about virus from credible source) and work from home options</td>
<td><strong>Ensure resources required to restart</strong></td>
</tr>
<tr>
<td>14. Consider short-term stabilization for suppliers (e.g., low-interest loan) to allow for a faster restart</td>
<td><strong>Work with supplier to source personal protective equipment for production lines operating in affected markets (e.g., glasses, gloves and masks) operating in</strong></td>
</tr>
<tr>
<td><strong>Understand additional options</strong></td>
<td><strong>Ensure resources required to restart</strong></td>
</tr>
<tr>
<td>15. Determine what portion of supply can be swung to another site if shutdown persists based on sourcing strategy (single, dual, multi)</td>
<td><strong>Work with supplier to source personal protective equipment for production lines operating in affected markets (e.g., glasses, gloves and masks) operating in</strong></td>
</tr>
<tr>
<td>16. Identify ways to expedite qualification process and/or insource</td>
<td><strong>Ensure resources required to restart</strong></td>
</tr>
<tr>
<td>17. Determine possible geographies and supplier shortlists in case alternate supply is required</td>
<td><strong>Build collaborative relationship w/ ext. partners</strong></td>
</tr>
</tbody>
</table>

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\(^1\) Buffer stock from Chinese New Year may provide a cushion and potential false sense of security. Impact likely to be felt first in JIT supply chains (e.g., automotive).

\(^2\) Given costs, airfreight might not be an option for many industries; availability is already limited.