COVID-19 is, first and foremost, a humanitarian challenge. COVID-19 has affected communities on multiple continents, with over 3,500 deaths out of over 105,000 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 (March 9, 2020)

- **COVID-19 continues to spread rapidly around the world.** Four transmission complexes (i.e., China, East Asia, Middle East, Europe) are active, with a fifth emerging in the US. Governments globally are preparing for the virus to hit their countries.

- **Epidemiologist consensus suggests that the virus is highly transmissible and disproportionately impacts older segments of the population with underlying conditions.** The average patient infects 1.6 to 2.4 other people, and based on recent research, the fatality rate for patients in their 70s was three to four times the average. Other reports describe fatality rates for patients under 40 to be 0.2 percent.

- There are, however, three swing factors that remain unclear but could play a large role in how the virus evolves:
  - **Extent of undetected, milder cases.** Those that are infected often display only mild or no symptoms, so it is easy for cases to be missed. Some studies suggest that there may be more instances of mild cases than are being detected, which means that the fatality ratio could be lower.
  - **Whether the virus is subject to seasonality.** There is no evidence so far on whether COVID-19 will show seasonality (i.e., naturally reduce in the northern hemisphere as spring progresses). Coronaviruses in animals are not always seasonal but have historically been so in humans for reasons that are not fully understood. The behavior of this COVID-19 strain is, at this point, not entirely predictable.
  - **Asymptomatic transmission.** Evidence is mixed about whether asymptomatic people can transmit the virus, and about the length of the incubation period.

- **Given these considerations, there are three possible scenarios for COVID-19 and its economic impact:**
  - **Quick recovery scenario:** Confirmation of the fatality ratio and disease severity rate in the population of those of working age and below, combined with strong public health and other measures with limited duration of economic shutdown. While there is a reduction in consumer demand, it is localized and restricted in terms of duration. Expected 2020 global GDP growth drops from 2.5% to ~2.0%.
  - **Global slowdown scenario:** Countries find it difficult to replicate strong public health measures, contributing to continued case growth. Despite that, socioeconomic reaction remains more localized given strong countermeasures taken. Greater shifts observed in daily behaviors, and certain sectors are deeply impacted. Ultimately, the spread of the virus is slowed down by seasonality. The economy recovers in late Q2, but 2020 global GDP growth drops to ~1.0-1.5%.
  - **Global pandemic scenario:** There is a global, generalized spread of COVID-19, which is not impacted by seasonality. The economy experiences a demand shock that lasts for most of the year. Health systems might be overwhelmed in countries that face large-scale human impact. Overall, this scenario results in a recession, with global growth in 2020 falling to between -1.5% and +0.5%.

- **Given the rapid spread of COVID-19 to date, companies could consider the following actions:** Protect and provide purpose to employees, stress-test their financials, stabilize the supply chain, engage customers, and integrate all these efforts under a central Nerve Center.
COVID-19 – Epidemiological information
Latest as of March 9, 2020

Impact to date1

<table>
<thead>
<tr>
<th>Reported confirmed cases</th>
<th>Deaths</th>
<th>Countries/territories affected2</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;105,000</td>
<td>3,500</td>
<td>102</td>
</tr>
</tbody>
</table>

Number of new affected countries/territories in the last 7 days

43

Countries/territories with evidence of local transmission3

53

Countries/territories with at least 100 reported cases4

17

~5% New reported cases are in China in the last 7 days

~74% New reported cases are in South Korea, Italy and Iran in the last 24 hours

Features of disease to date5

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 Hubei6

Comparison to other diseases

<table>
<thead>
<tr>
<th>Reproduction number7</th>
<th>The average number of individuals infected from each infected individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>High (&gt;4)</td>
<td>COVID-19, Ebola (West Africa 2014), Influenza H1N1 2009, Influenza H2N2 1957</td>
</tr>
<tr>
<td>Medium (2-4)</td>
<td>SARS-CoV, MERS-CoV, Measles1, Polio8, Smallpox</td>
</tr>
<tr>
<td>Low (&lt;2)</td>
<td>Chickenpox</td>
</tr>
</tbody>
</table>

Case fatality ratio8

<table>
<thead>
<tr>
<th>Low (&lt;2%)</th>
<th>Medium (2-15%)</th>
<th>High (&gt;15%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ebola (West Africa 2014)</td>
<td>~5%</td>
<td>~74%</td>
</tr>
</tbody>
</table>

Early identification of the disease, 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 43 new countries/territories with cases in the last 7 days (102 countries/territories affected in total)
- Number of countries/territories with signs of local transmission3 is rising every day (~5 more countries/day in the last 7 days)
- Reported cases in Italy in Iran passed 5000 total cases in the last 24 hours
- Ability to contain disease in the Italy-, Iran- and US-centered complexes, and countries within transmission complexes, will be critical in the next week to limit propagation

China (outside Hubei)

- Daily incremental case count remains low for the last 7 days; fewer than 1 reported cases per million residents
- Overall downward trends in the number of confirmed cases reported

1. Latest numbers are available from a number of sources, including daily situation reports from the World Health Organization
2. Previously only counted countries; now aligned with new WHO reports; excluding cruise ship
3. Previously noted as community transmission in McKinsey documents; now aligned with WHO definition.
4. >=100 reported cases in China, South Korea, Japan, Singapore, Italy, Germany, France, Spain, Switzerland, UK, Netherlands, Belgium, Sweden, Norway, Austria, Iran and US
5. Evidence on exact numbers are emerging, however expected to decrease as viral containment measures intensify and treatments are developed
6. 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.
7. In outbreak setting or at the beginning of the introduction of a new disease

Source: World Health Organization, CDC, latest news
Four major transmission complexes exist, with a fifth emerging
A complex combines confirmed local transmission, >100 confirmed cases, tough-to-prevent people movement

5 complexes with COVID-19 propagation
Deep economic integration and regular human and material movements mean that it will be tough to limit virus propagation within these complexes

- >250 reported cases
- 100-249 reported cases
- 50-99 reported cases
- 10-49 reported cases
- <10 reported cases
- Suspected local transmission

<table>
<thead>
<tr>
<th>Transmission complexes</th>
<th>Trend</th>
<th>Total cases</th>
<th>Total deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. China complex:</strong></td>
<td></td>
<td>80,859</td>
<td>3,100</td>
</tr>
<tr>
<td>- Mature propagation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2. Asia (excl. China) – South Korea centered complex:</strong></td>
<td>Ongoing propagation</td>
<td>8,021</td>
<td>61</td>
</tr>
<tr>
<td><strong>3. Europe – Italy centered complex:</strong></td>
<td>Ongoing propagation</td>
<td>9,456</td>
<td>255</td>
</tr>
<tr>
<td><strong>4. Middle East™ – Iran centered complex:</strong></td>
<td>Ongoing propagation</td>
<td>6,180</td>
<td>149</td>
</tr>
<tr>
<td><strong>5. Americas – USA centered complex:</strong></td>
<td>Early propagation</td>
<td>347</td>
<td>12</td>
</tr>
<tr>
<td><strong>6. Africa:</strong></td>
<td></td>
<td>27</td>
<td>0</td>
</tr>
<tr>
<td>- Limited to no propagation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Indicating the trend in incremental reported cases per day
2. Includes Western Pacific (excl China) and South-East Asia WHO regions
3. Eastern-Mediterranean WHO region
4. <20 cases in Algeria and <5 cases in Senegal, Cameroon, South Africa, Nigeria and Togo
5. Excludes Cruise Ship

Source: World Health Organization, team analysis
COVID-19 – China’s context and case count growth ex-Hubei

China context

Population
1.4 bn with 11% over 65 years old

Population density
~3.3X higher population density in China compared to upper middle income countries

Respiratory Risk
8.6% of adults have underlying respiratory issues (COPD)

1.4X higher mortality rate attributed to pollution compared to upper middle income countries

Primary health system
5.6% of the doctors in township health centers had formal medical education in 2010 compared to 10% in 2017

What we know:
- Transmissibility
- Impact on older patients with underlying conditions

What is being discovered:
- Extent of mild cases and implied case fatality ratio
- Seasonality
- Asymptomatic transmission

Potential incremental case growth (illustrative only)

Daily incremental cases
China ex-Hubei, count

End of Lunar New Year
February
March

Source: World Health Organization, World Bank Development Indicators, BMJ, expert interviews

1. World Bank Data
2. Koch et al, Characteristics and health burden of the undiagnosed population at risk of chronic obstructive pulmonary disease in China, PMC Public Health (2019); Fang et al, Chronic obstructive pulmonary disease in China: a nationwide prevalence study; The Lancet Respiratory Medicine, 2018; 3. BMJ
Unaddressed, COVID-19 can spread rapidly – yet public health measures can help minimize spread

<table>
<thead>
<tr>
<th>Diamond Princess cruise ship</th>
<th>Migration post-Lunar New Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overview</strong></td>
<td><strong>25 Jan</strong></td>
</tr>
<tr>
<td>~3,700</td>
<td><strong>~3bn</strong></td>
</tr>
<tr>
<td>1 Feb</td>
<td></td>
</tr>
<tr>
<td>Individual who had been a passenger tested positive for COVID-19 six days after leaving</td>
<td></td>
</tr>
<tr>
<td>4 Feb</td>
<td></td>
</tr>
<tr>
<td>10 individuals who had been on board tested positive for COVID-19; Japan’s Ministry of Health places the entire ship under a 14-day quarantine</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Response</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Japanese public servants tested passengers; those who tested positive were transported to health facilities</td>
<td>Extension of the Lunar New Year holiday</td>
</tr>
<tr>
<td></td>
<td>Those who had symptoms stayed on board until cleared</td>
<td>14-day self-quarantine of everyone travelling from affected areas</td>
</tr>
<tr>
<td></td>
<td>Some repatriated passengers who were placed under additional quarantine tested positive</td>
<td>Rapid expansion of hospital facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Closure of tourist sites, cancelled public events</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Travel restrictions imposed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Impact</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>~700</td>
<td></td>
<td>Number of incremental cases February 1, China ex-Hubei</td>
</tr>
<tr>
<td>~50%</td>
<td></td>
<td>Number of incremental cases February 11, China ex-Hubei</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: WHO, Statista, Press search

Highly transmittable, especially in confined spaces
Few or no symptoms in many confirmed cases
Comprehensive public health measures effective in reducing case count growth post-Lunar New Year, minimizing viral spread despite high passenger volumes
## Three scenarios for how COVID-19 could evolve

### Potential scenarios as of March 9, 2020

### Quick recovery
- **Public health response** similarly effective as with China
- Virus is **seasonal**
- **Fatality ratio** similar to that of the flu (or an existing therapy proves effective)
- Socioeconomic reaction is **localized**
- **Strong public reaction**, initial drop in demand, but **peak comes quickly**
- **Working populations** change some daily habits but resume economic activity

- **China recovery** is largely complete, incl. Hubei by early Q2
- **Relatively fast rebound** after initial acute drop in consumer demand
- US, Europe economic **slowdown until the end of Q1**
- **Varied impact** in other economies (Middle East, rest of Asia, Africa, LatAm) – slowdown in Middle East until Q2; some disruption in Africa, LatAm

### Global slowdown
- **Less effective public-health response** than China
- Virus is **seasonal**
- **Fatality ratio** is higher than or near that of the flu, dependent on public health response
- Impact largely **localized** in Europe and US; some spread in **other transmission complexes** in Africa, India, with more generalized reactions
- Greater shift in **daily behaviors**

- **China recovery** is largely complete, incl. Hubei by early Q2
- **US, Europe sees economic slowdown until mid-Q2**; other regions see varied impact (rest of Asia, Middle East more impacted; LatAm, Africa more insulated)
- **Certain sectors** (e.g., aviation, hospitality) deeply hit – missing the summer season
- **Other sectors** (e.g., CPG) experience acute initial drop, recover at end-Q2

### Global pandemic and recession
- **Less effective public-health response** than China
- Virus is **not seasonal** so transmissibility does not decline with northern hemisphere spring; case resurgence observed in China
- **Fatality ratio** is higher than that of the flu, because of disease characteristics or insufficient health system response
- Continued **case growth count** through Q2 and Q3
- Reaction is **generalized**

- **China recovery increases transmission** and potential resurgence in cases; complete by Q4 2020
- **US, Europe see generalized reaction**
- Global recession – economic **slowdown across all regions**
- Consumer confidence does not recover until **end Q3 or beyond**

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Source: Expert interviews, team analysis

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**McKinsey & Company** 8
## Potential impact of COVID-19 outbreak on 2020 GDP growth

Even in a “quick recovery” scenario, regions experience significant economic disruption

### North America - USA
- 2020 GDP Growth Projection
- 1.74
- 1.34
- Slowdown until end Q1 but annual consumer consumption not down
- Localized economic impact
- Financial market shocks
- Supply chain dependency on China; some productivity declines

### Latin America
- 2020 GDP Growth Projection
- 1.10
- 1.06
- Relatively lower exposure to China and East Asia supply chains
- More insulated from travel and tourism disruptions in East Asia, EU
- Slowdown until Q1, given oil demand shocks, financial market volatility, decreasing business investments

### Europe
- 2020 GDP Growth Projection
- 1.29
- 0.99
- Spillover from weaker growth in China and rest of Asia via trade and financial channels, as well as supply chain disruptions
- Slowdown until end Q1
- Localized economic impact

### Middle East, North Africa
- 2020 GDP Growth Projection
- 2.39
- 1.95
- Spillover from weaker growth in China and rest of Asia via trade and financial channels, as well as supply chain disruptions
- Continued case growth through early Q2

### Africa (Sub-Saharan)
- 2020 GDP Growth Projection
- 2.17
- 1.92
- Limited outbreak spread, but potential to overwhelm health system infrastructure
- Slowdown through end of Q1, with Chinese recovery fueling renewed investment, trade

### China
- 2020 GDP Growth Projection
- 5.99
- 4.68
- Resumption of factory output by end Q1, given effective measures
- Consumer consumption down in Q1, Q2, but confidence restored and domestic retail spend recovered by end Q2

### East Asia
- 2020 GDP Growth Projection
- 4.19
- 3.23
- Initial supply chain shocks and decrease in Chinese tourism, travel
- Follow-on shock given delayed disease propagation
- Fall in local consumer demand; measures taken impact social gathering and related sectors

### Quick recovery scenario:
**Global GDP growth falls from 2.5% to ~2.0%**

Largely driven by supply chain disruptions, Q1 global financial market shock, v-shaped fall and subsequent recovery in consumer demand

---

1. Quick Recovery scenario model outputs are provisional and subject to change

Source: World Health Organization, Oxford Economics, Industry reports, Press articles, team analysis
Potential impact of COVID-19 outbreak on 2020 GDP growth

In a “global slowdown” scenario, regions experience significant economic disruption and prolonged recovery

1. Global Slowdown scenario model outputs are provisional and subject to change.

Source: World Health Organization, Oxford Economics, Industry reports, Press articles, team analysis

North America - USA

- 2020 GDP Growth Projection
  - 1.74 0.45

  - Slowdown until mid Q2
  - Significant fall in discretionary spend in several impacted metro areas moderate decline elsewhere, with recovery in 2H 2020
  - Investment and demand shocks; services sector remains dampened through Q2

Latin America

- 2020 GDP Growth Projection
  - 1.10 0.17

  - Relatively lower exposure to China and East Asia supply chains
  - Continue slowdown, given oil demand shocks, financial market volatility, decreasing business investments

Europe

- 2020 GDP Growth Projection
  - 2020 GDP Growth Projection
  - 1.29 0.09

  - Slowdown until mid Q2
  - Generalized economic impact across European countries
  - Investment and demand shocks; services sector remains dampened through Q2

Middle East, North Africa

- 2020 GDP Growth Projection
  - 2.39 1.21

  - Recovery is largely complete by Q2
  - Investment and demand shocks persist, but recovery by end of 2020
  - Prolonged period of lower consumer confidence, but catch-up effect in consumer spend in

Africa (Sub-Saharan)

- 2020 GDP Growth Projection
  - 2.17 1.08

  - Spillover from weaker growth in the rest of the world, via trade and financial channels, as well as supply chain disruptions

China

- 2020 GDP Growth Projection
  - 2020 GDP Growth Projection
  - 5.99 3.82

  - Continuous consumer demand drops, persists through Q2
  - Supply chain shocks across sectors, persists through Q2

East Asia

- 2020 GDP Growth Projection
  - 2020 GDP Growth Projection
  - 4.19 2.36

  - Potential to overwhelm health system infrastructure
  - Longer duration, greater slowdown, exacerbated by impacts from other regions

Global slowdown scenario:
Global GDP growth falls from 2.5% to ~1.0 – 1.5%
Q1 global financial market shock, u-shaped fall and slower recovery in consumer demand, supply chain disruption
All sectors are impacted, with several seeing severe consequences
Preliminary views based on base case – Subject to change as the COVID-19 outbreak evolves

<table>
<thead>
<tr>
<th>Sector</th>
<th>Estimated degree of impact, in terms of duration</th>
<th>Estimated global restart (Global slowdown scenario)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism and hospitality</td>
<td>Severe ripple effects (e.g., closures in Paris, tourism down 50% in Vietnam, despite lack of local transmission)</td>
<td>Q4</td>
</tr>
<tr>
<td></td>
<td>Delayed recovery until winter season, when disease might surge again</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potential of more localized impact, containing negative demand hit</td>
<td></td>
</tr>
<tr>
<td>Aviation / airlines</td>
<td>Sustained headwinds, with global travel acutely impacted; summer season missed – forward bookings for Mar-April down significantly; reports of over 40% in certain airlines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pace of recovery faster for domestic travel (~2 quarters); slower pace of recovery for long-haul and/or international travel (up to ~3-4 quarters)</td>
<td></td>
</tr>
<tr>
<td>Oil and gas</td>
<td>Oil price decline driven by both longer-term demand impact and short-term supply overhang Rebound expected with resumption of consumer demand, but long-term impact likely if situation persists and depresses prices beyond a year</td>
<td></td>
</tr>
<tr>
<td>Automotive</td>
<td>Existing vulnerabilities (e.g., trade tensions, declining sales) amplified by acute decline in Chinese demand, continued supply chain and production disruption (in China, rest of Asia, now EU) Headwinds to persist into Q3 given tight inventories (&lt;6 weeks), supply chain complexity (therefore, minimal ability to shift)</td>
<td></td>
</tr>
<tr>
<td>Consumer products</td>
<td>Overall moderate decline in private consumption and exports of services Demand for certain product segments (e.g., food, produce) resilient; significant online growth (though hampered by labor shortage) Potential of localized impact, containing negative demand hit</td>
<td></td>
</tr>
<tr>
<td>Consumer electronics, semi-conductors</td>
<td>Market structure shifts accelerated (e.g., strategic moves to diversify supply chain) Downstream impact due to supply chain challenges in China, rest of Asia (esp. South Korea), causing delays in 5G, product development Pace of recovery to differ by sub-sector (e.g., semiconductor likely faster)</td>
<td></td>
</tr>
</tbody>
</table>

Source: IHS Market; McKinsey Global Institute Analysis; Subject matter experts; Press reports
Many disruptions exist across the supply chain, but the full impact has yet to be felt

**Situation today**

- **4X** fatality ratio
  - Hubei still in early recovery
- **80%** plants restarted
  - Restart underway
  - Workers still returning
- **50%** truck capacity
  - 10+ day delay to get goods to port
- **28%** BDI increase
  - Baltic Dry Index 28% higher since end LNY, but 13% below 2/2019
- **90%** car sales decrease
  - China consumer sentiment sharply lower

**What to expect**

- Hubei recovers early Q2
- Trucking capacity constraints ease
- Logistics capacity returns, but faces constraints; near-term price increase
- Inventory ‘whiplash’, 7-8 wks auto, 2-4 wks high-tech
- GDP impact
  - Sharp rebound
  - Demand shift

**Impact:**

- **HI**
- **MED**
- **LO**

Source: WHO Situation Reports; CDC travel notice, IATA, Reuters, TomTom traffic index, press searches; HSBC Business School, Tencent News, Sina news, Beijing Environmental Protection Monitoring Center, Shenzhen Environment Network
**COVID-19 Response Workstreams**

**Integrate via Nerve Center**
- Define, align leaders on potential scenarios
- Create ‘single source of truth’ about the headwinds
- Run table-top exercises for tough decisions
- Provide clear policies and guidelines
- Ensure transparent two-way communications
- Monitor issues on near real-time basis, with rapid response
- Track adherence to policies
- Support global response efforts
- Run financial stress test for all scenarios
- Define trigger-based portfolio of actions
- Update demand forecasts
- Map exposure to suppliers (Tiers 1, 2, 3), estimate impact
- Support supplier stability and operational re-starts
- Act on part rationing, inventory, logistics
- Drive greater supply chain risk management in the medium term
- Ensure customer transparency (B2B context)
- Define plan for priority growth segments
- Refresh customer loyalty programs, incentive plans

**Protect & Give Purpose**

**Stress-test Financials**

**Stabilize Supply Chain**

**Engage Customers**

---

*Cross-functional COVID-19 Response Team*

*VERSION 3 – CURRENT AS OF MARCH 9, 2020*
COVID-19 Response Nerve Center organization

- Multiple semi-autonomous, cross-functional teams working in parallel (helps speed)
- Agile principles, enabled by clearly articulated values
- Simple meeting cadence and radical transparency across groups (e.g., all working materials available to all)

Example nerve center organization – key roles

- Protect & Give Purpose
  - Head of HR
  - Security
  - Legal
  - Employee comms
  - Ombudsman

- Stabilize Supply Chain
  - Head of Procurement
  - Procurement manager
  - Supply Chain analyst
  - Regional SC mngts (multiple)

- Integrate via nerve center
  - Scenario planning analyst
  - Epidemiological expert
  - Project coordinator
  - Sr. C-suite leader

- Stress-test financials
  - CFO
  - Financial analyst
  - Strategy or BD manager
  - Treasury

- Engage customers
  - Head, Sales & Mktg.
  - Financial analyst
  - Customer comms
  - SKU manager
  - Incentive manager
## Example measures that organizations have deployed for employees

<table>
<thead>
<tr>
<th>Industry agnostic</th>
<th>Non-manufacturing or direct service industries</th>
<th>Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travel restrictions</strong></td>
<td>• Delaying all non-essential travel to highly affected areas (e.g., China, Italy, Japan)</td>
<td>• Changing shifts to allow for parents to be at home with kids (i.e., in areas with school closures)</td>
</tr>
<tr>
<td></td>
<td>• Cancelling big gatherings and events</td>
<td>• Introducing virtual shifts so certain roles (e.g., monitoring) are minimized</td>
</tr>
<tr>
<td><strong>Ways of working</strong></td>
<td>• Splitting critical workforce in different locations / satellite sites or different parts of the building/workspace</td>
<td>• Staggering shifts (e.g., 6 hour x 4 shifts)</td>
</tr>
<tr>
<td></td>
<td>• Devolving manager accountability so employees could put their health first and take decision accordingly</td>
<td>• Staggering start times and on-site meal offerings to minimize crowding</td>
</tr>
<tr>
<td></td>
<td>• Quarantining employees who recently visited highly affected areas</td>
<td>• Temporarily closing production sites in highly affected areas (e.g., Northern Italy)</td>
</tr>
<tr>
<td></td>
<td>• Quarantining employees exposed to confirmed cases (e.g., working on the same floor)</td>
<td>• Quarantining cohorts in advance of shifts</td>
</tr>
<tr>
<td></td>
<td>• Keeping all large meetings virtual (using VC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Restricting outside visitors / third parties</td>
<td></td>
</tr>
<tr>
<td><strong>Health precautions</strong></td>
<td>• Over-communicating policies around safety/precaution in a simple readable format</td>
<td>• Reducing the range of products</td>
</tr>
<tr>
<td></td>
<td>• Sanitizing workplaces on a more frequent basis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sending care packages to employees (e.g., a thermometer, hand sanitizer and vitamin C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Monitoring temperature of all employees at the entrance to the building</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>• Encouraging open communication to ensure employees can speak up if they feel unsafe</td>
<td>• Leveraging parcel shipping technology to reallocate its inventory to mitigate the impact of the virus</td>
</tr>
<tr>
<td></td>
<td>• Revising policies to ensure no punitive measures taking for “days off” due to being ill</td>
<td>• Dividing production facilities (e.g., sealing out certain areas, making handovers without physical contact, protecting groups of people from each other)</td>
</tr>
</tbody>
</table>

Source: Team analysis, press search
**Example supply chain actions to consider**

### Immediate (2-4 weeks)

**Understand exposure**
1. Determine truly critical components and understand risks of tier 1 to tier 2 suppliers onwards
2. Define current inventory buffer and locations
3. Identify origin of supply (i.e., Hubei/Wuhan) to identify severity of risk
4. Conduct scenario planning to understand financial and operational implications in prolonged shutdown (scenarios 2 and 3)
5. Work with S&OP to get 3-6 month accurate demand signal segmenting likely to be impacted demand to determine required supply

**Take action to address anticipated shortages**
6. Look to ramp up now on alternative sources if supplies are in Hubei and accelerate exploration of additional options
7. Change mode of transportation to reduce replenishment lead-time and pre-book air freight / rail capacity as required by current exposure
8. Optimize limited production by prioritizing for items that would support better healthcare delivery and outcomes
9. Collaborate with all parties to jointly leverage freight capacity, new/alternate supply sources, etc.
10. Watch for extending lead times to gauge performance and capacity against supplier promises
11. Use after sales stock as bridge to keep production running

**Ensure resources required to restart**
12. Work with supplier to source personal protective equipment for production lines operating in affected markets (e.g., glasses, gloves and masks)
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
14. Consider short-term stabilization for suppliers (e.g., low-interest loan) to allow for a faster restart

**Understand additional options**
15. Determine what portion of supply can be swung to another site if shutdown persists based on sourcing strategy (single, dual, multi)
16. Identify ways to expedite qualification process and/or insource
17. Determine possible geographies and supplier shortlists in case alternate supply is required

### Mid-term (2-4 months)

**Continuously improve material supply stability**
- 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
- Enhance the demand verification process to correct inflated demand to mitigate the bullwhip effect
- Provide continuous support the mid-small size tier 2-3 suppliers in financial troubles
- Assess regional risks for current and backup suppliers

**Kick off designing resilient supply chain for the future**
- Establish a supply chain risk function
- Digitalize 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

**Build collaborative relationship w/ external partners**
- Work with government to explore potential tax benefits
- Actively engage investors and other stakeholders to build transparency on the situation and get help

---

1. Buffer stock from Lunar 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.
Leading indicator dashboard
### COVID-19 Leading Indicator Dashboard

**Propagation of COVID-19 across new transmission complexes**

#### Epidemiological Indicators

<table>
<thead>
<tr>
<th>Cluster</th>
<th>Representative country</th>
<th>Date of initial case</th>
<th>Total number of cases</th>
<th>Number of new cases in last 14 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia (ex-China)</td>
<td>South Korea</td>
<td>Prior to 01/20</td>
<td>7,134</td>
<td>6,532</td>
</tr>
<tr>
<td></td>
<td>Japan</td>
<td>Prior to 01/20</td>
<td>455</td>
<td>323</td>
</tr>
<tr>
<td></td>
<td>Singapore</td>
<td>01/24</td>
<td>138</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Rest of region</td>
<td>Prior to 01/20</td>
<td>294</td>
<td>190</td>
</tr>
<tr>
<td>Europe</td>
<td>Italy</td>
<td>01/31</td>
<td>5,883</td>
<td>5,807</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>01/25</td>
<td>707</td>
<td>694</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>01/28</td>
<td>795</td>
<td>779</td>
</tr>
<tr>
<td></td>
<td>Rest of region</td>
<td>01/29</td>
<td>2,072</td>
<td>2,044</td>
</tr>
<tr>
<td>Middle East</td>
<td>Iran</td>
<td>02/20</td>
<td>5,823</td>
<td>5,795</td>
</tr>
<tr>
<td></td>
<td>Rest of region</td>
<td>02/15</td>
<td>357</td>
<td>355</td>
</tr>
<tr>
<td>Americas</td>
<td>US</td>
<td>01/23</td>
<td>213</td>
<td>178</td>
</tr>
<tr>
<td></td>
<td>Rest of region</td>
<td>01/27</td>
<td>134</td>
<td>125</td>
</tr>
</tbody>
</table>

#### Compound daily growth in cases

- **Last 3 days**:
  - South Korea: 7%
  - Japan: 13%
  - Singapore: 8%
  - Rest of Asia: 10%
  - Italy: 24%
  - France: 36%
  - Germany: 45%
  - Rest of Europe: 45%
  - Iran: 26%
  - Rest of Middle East: 18%
  - US: 18%
  - Rest of Americas: 41%

- **Prior 3 days**:
  - South Korea: 11%
  - Japan: 8%
  - Singapore: 1%
  - Rest of Asia: 22%
  - Italy: 11%
  - France: 41%
  - Germany: 27%
  - Rest of Europe: 46%
  - Iran: 44%
  - Rest of Middle East: 9%
  - US: 28%
  - Rest of Americas: 20%

- **Case fatality ratio**:
  - South Korea: 0.7%
  - Japan: 1.3%
  - Singapore: 0%
  - Rest of Asia: 0%
  - Italy: 2.5%
  - France: 0%
  - Germany: 5.2%

- **Peak case count observed**: N

#### Economic/policy indicators

<table>
<thead>
<tr>
<th># of countries/territories restricting travel</th>
<th># of airlines suspending service to impacted country</th>
<th>Traffic congestion level</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>X 11</td>
<td>Data N/A</td>
</tr>
<tr>
<td>26</td>
<td>X 15</td>
<td>Data N/A</td>
</tr>
</tbody>
</table>

**Note:**
- All countries or regions have documented 3rd generation cases.
- Likely to fall as testing becomes more widely available. Source: WHO Situation Reports; CDC travel notice, IATA, Reuters, TomTom traffic index, press searches.

**Current phase**

1. **Stage 1:** Small number of cases identified; no sustained local transmission
2. **Stage 2:** Disease spread and sustained local transmission
3. **Stage 3:** Government action/shift in public behavior. Not all affected regions enter stage 3, but significant gov. intervention/economic impacts signal prolonged recovery
4. **Stage 4:** Case growth/stretched health systems
5. **Stage 5:** New case drop, activity resumption

**Epidemiological Indicators**

- 1. Based on WHO definition, previous version used community transmission and local transmission interchangeably.
- 2. Case Fatality Rate calculated as (deaths on day X) / (cases on day X). Note that previous versions of this dashboard (February 28 and prior updates), calculated CFR = (deaths on day X) / (cases on day X-7) to account for disease incubation period. We changed the definition because the old formula was causing confusion for some readers.
- 3. Assessment based on observed stoppage in growth of cases and medical community’s opinion validated by external sources.
- 4. Include route suspension or reduction
- 5. Based on representative cities: Tokyo, Singapore, Milan, Paris, Berlin, Los Angeles
- 6. Includes Western Pacific (excl China) and South-East Asia WHO regions
- 7. Eastern-Mediterranean WHO region

**Traffic congestion level**

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**CDC travel health notice**

- Alert Level 2
- None

**Traffic congestion level**

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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?

- Hubei remains deeply impacted
- Return to economic activity tough to foresee until mid Q2

Hubei recovery milestones to watch

- Daily infection rate, per million
  - Rate of confirmed cases consistently decreasing
  - New suspected/confirmed cases rate consistent with other provinces
  - Quarantine lifted
  - No additional spikes in case count
  - Public transport resumes
  - Factory activity return to pre-outbreak levels

- Fatality ratio, %
  - <0.01
  - <1%

CN economic restart

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

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

CN consumer confidence

How quickly will Chinese consumer confidence and purchasing activity return?

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

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McKinsey & Company