McKinsey & Company

COVID-19: Briefing Note

Global Health & Crisis Response

Updated: March 16, 2020

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.

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Executive summary

The situation now

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

Contents

COVID-19 appears to be more dangerous than the flu

Latest as of March 15, 2020

Features of the disease to date[1]

1.5-2x

Higher reproduction than the flu

Up to 20%

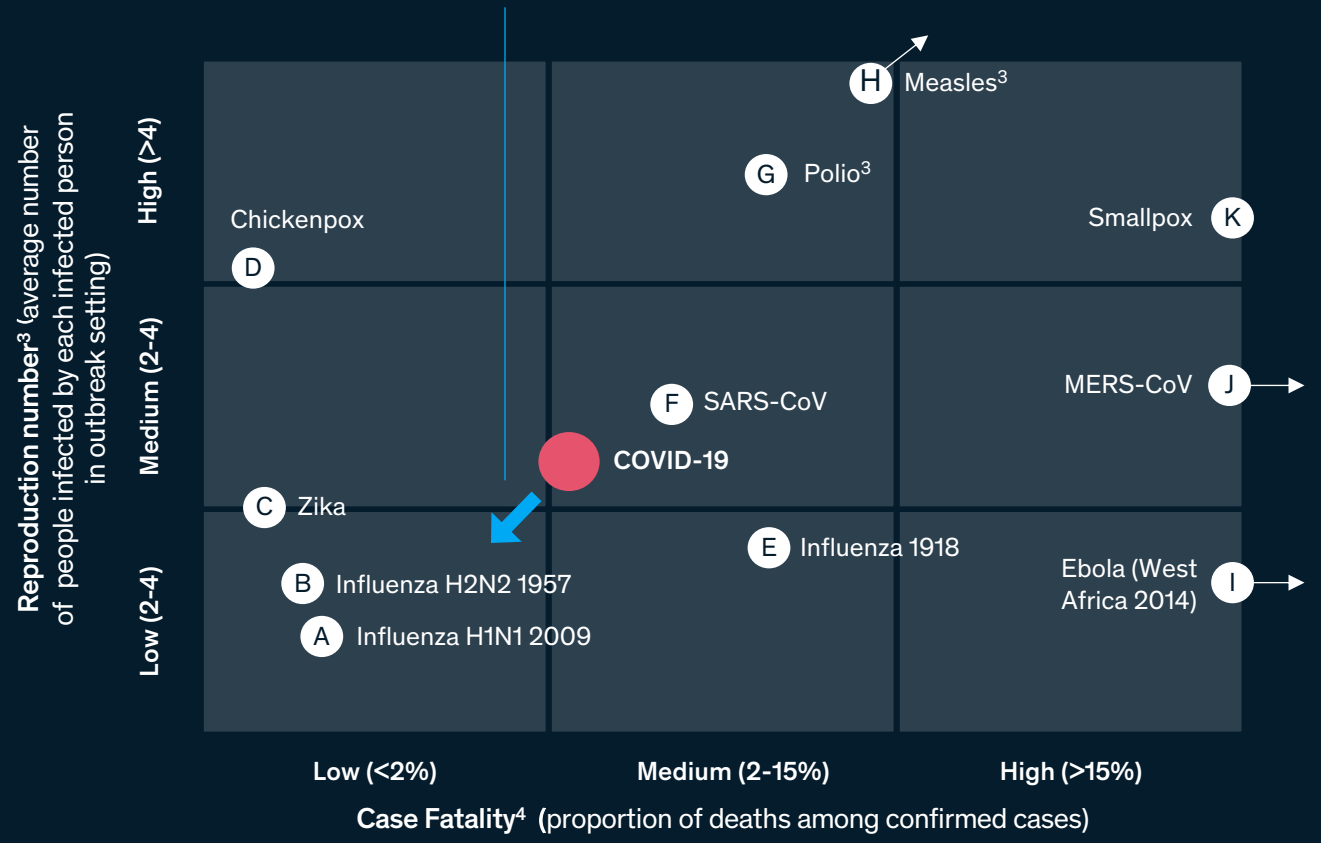
Of cases have a severe/critical form of the disease[6]

~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[2]

Comparison to other diseases[5]

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



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

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

The global spread is accelerating with more reports of local transmission

Latest as of March 15, 2020

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

Impact to date

>153,000

Reported confirmed cases

>5,700

Deaths

>140

Countries or territories with reported cases[1]

>80

Countries or territories with evidence of local transmission[2]

~40

Countries or territories with more than 100 reported cases[1]

<1%

China's share of new reported cases March 9th-15th

~75%

New reported cases on March 9-15th from Europe

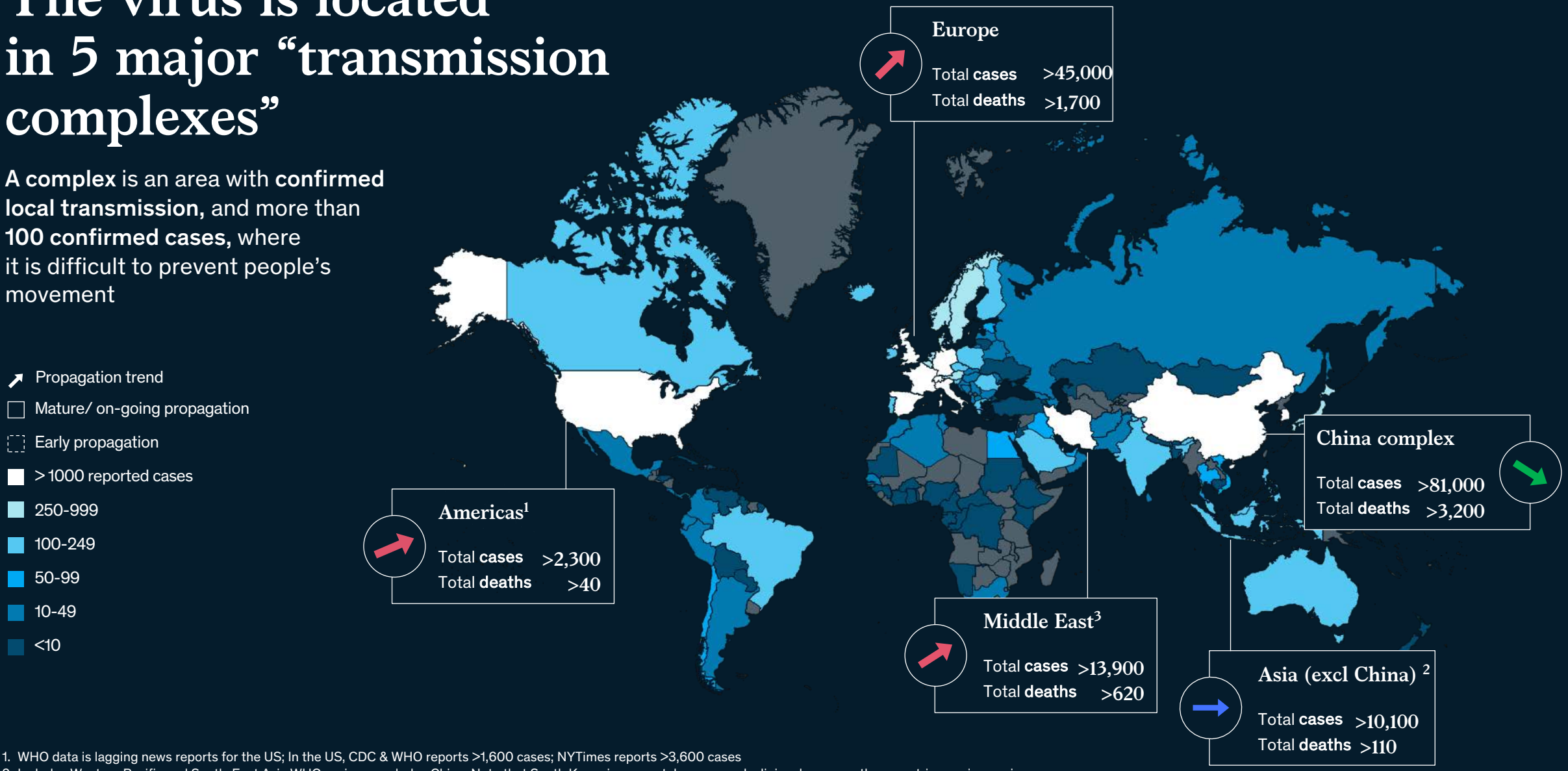
>40

New countries with cases March 9th-15th

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



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

Country				Status	Recent Actions
China	>81,000 Cases	>3,200 Deaths	~4.0% Case Fatality[2]	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
South Korea	>8,100 Cases	>70 Deaths	~0.9% Case Fatality[2]	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
Italy	>21,100 Cases	>1,400 Deaths	~6.8% Case Fatality[2]	~3,500 new cases on March 15th – 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
US[3]	>1,600 Cases	>40 Deaths	~2.4% Case Fatality[2]	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. 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

Overall, ~20% of cases are estimated to be severe/critical, requiring significant health capacity for testing and critical care infrastructure

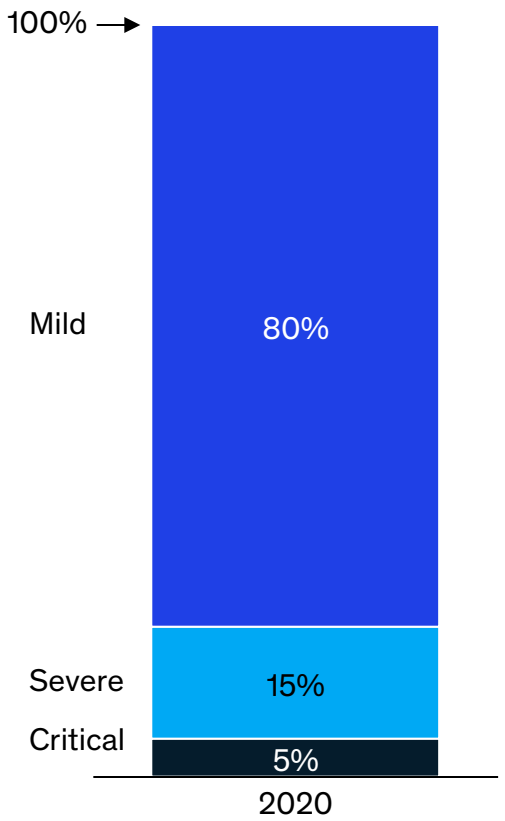
Context

WHO estimates ~20% of COVID-19 cases are severe (requiring oxygen) or **critical** (requiring ventilation)

This reflects a higher level of severity compared to influenza for instance

At a country level, mild cases may go undiagnosed

WHO estimated global distribution by severity of symptoms



Severity by country may vary

China

As of February 24, 2020 (~45K cases)

- **Similar mix of** mild / severe / critical confirmed cases to WHO estimate
- **~16K suspected cases were left undiagnosed,** driven by testing limitations

Italy

JAMA

ICU admissions in first two weeks represented 16% of all patients who tested positive for COVID-19

News reports

March 3, 2020	March 10, 2020	March 12, 2020
56% of patients who tested positive for COVID-19 are hospitalized	**ICUs almost at full capacity in Lombardy,** region hardest hit by COVID-19	**Northern regions trying to expand ICU** capacity with and 230+ ICU spots added

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, however limited testing may skew potential case severity/volume in countries like Italy

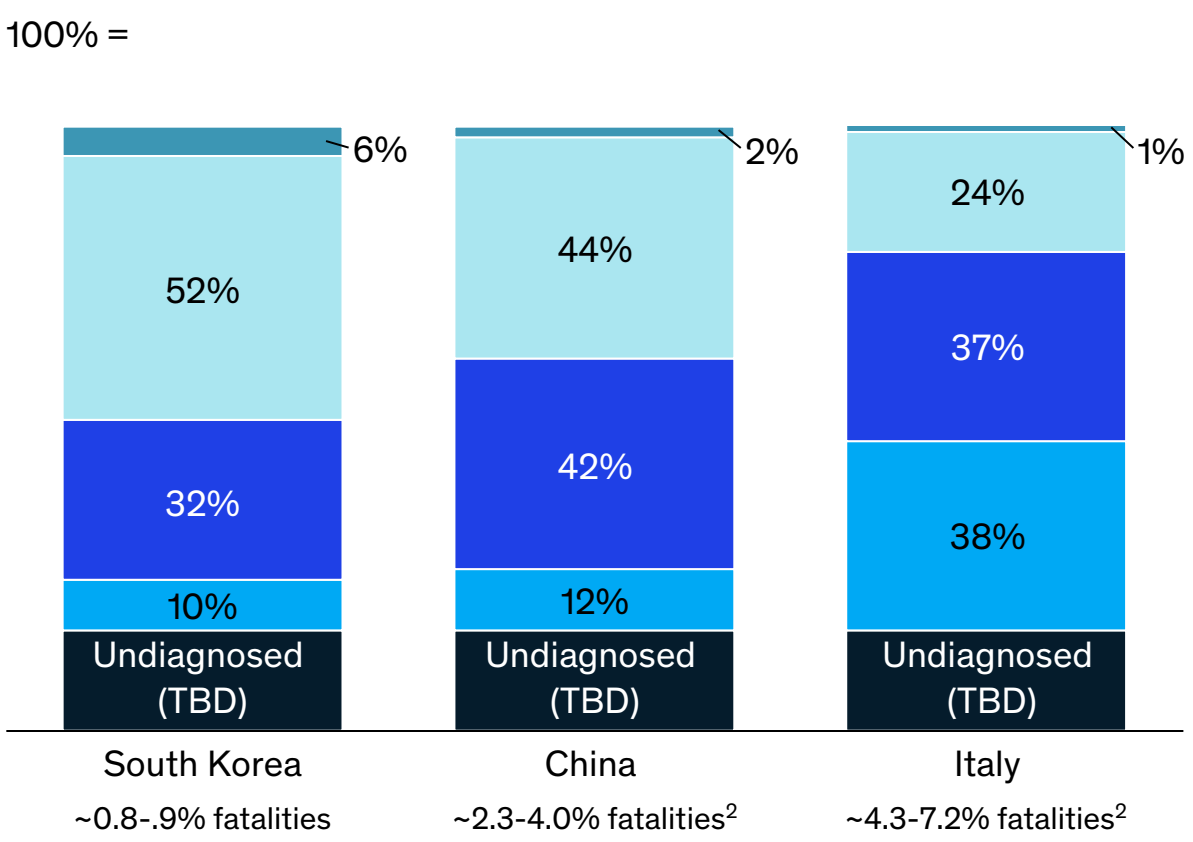
As of data from Feb 11 in China and as of March 16 and 15 in South Korea and Italy* respectively

Context

In all three countries, there is a significant differences 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



People over 70 make up nearly 40% of total cases in Italy compared to 10% in South Korea and 12% in China

S. Korea has performed substantially more tests than Italy

While Italy has 2nd oldest population in the world, they are still likely missing milder or asymptomatic case and younger cases which could impacting fatality rates

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

Context

WHO has estimated global case fatality rates at 3.4%

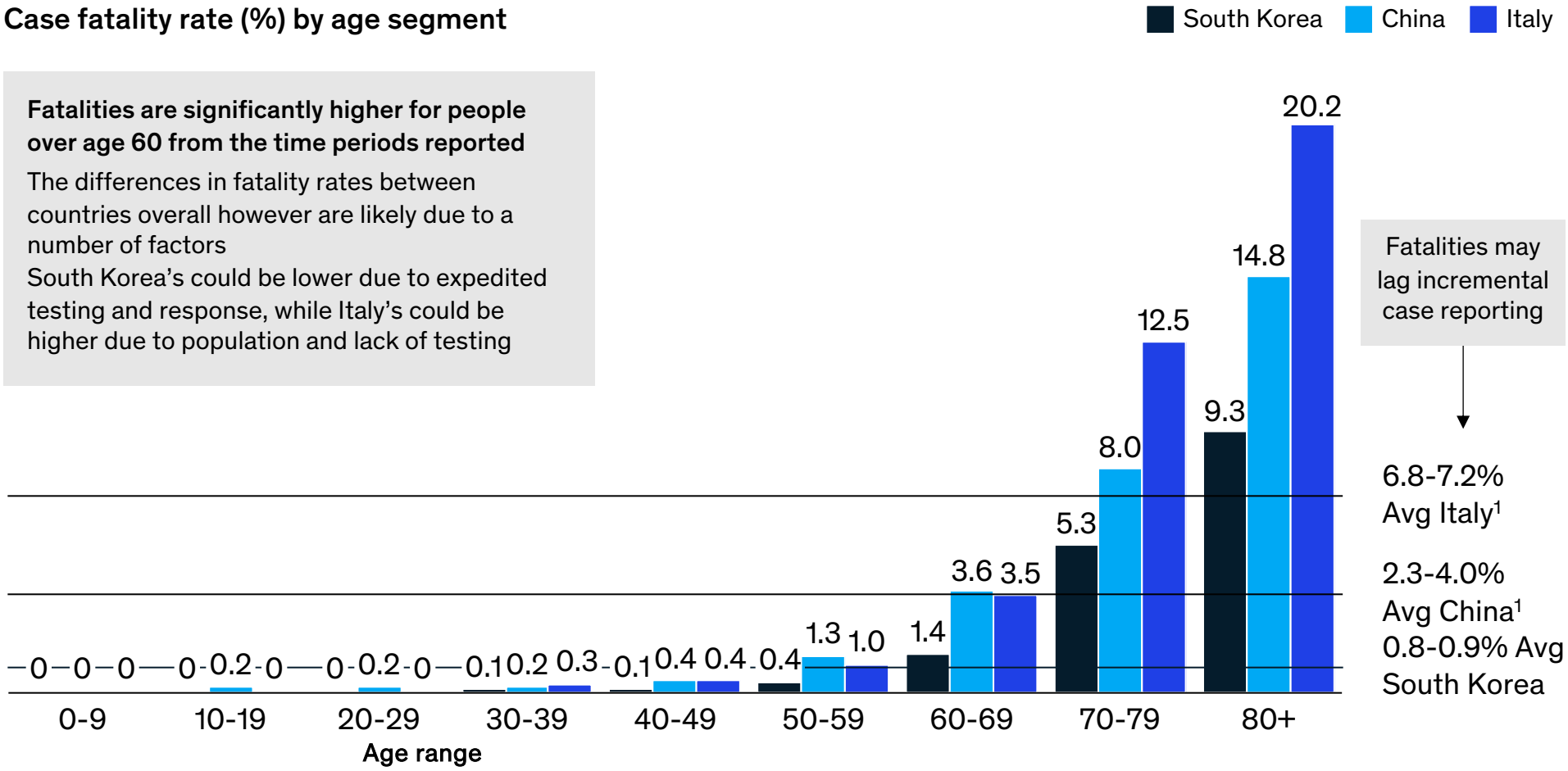
Rates vary significantly by age, co-morbidity, health system strength and other factors

Case fatality rate (%) by age segment

Fatalities are significantly higher for people over age 60 from the time periods reported

The differences in fatality rates between countries overall however are likely due to a number of factors

South Korea's could be lower due to expedited testing and response, while Italy's could be higher due to population and lack of testing



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

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

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Scenario overview

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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, may experience a large increase in cases once testing kits become widely available

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 resurging 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

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

Contents

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

See next slides

COVID-19 Integrated Nerve Center

A	Workforce protection	1	Policy & Management	Portfolio of policies and actions incl. prevention and incident response
		2	Two Way Communication	Multi-channel communications | Confidential reporting mechanisms | Source of truth
		3	Personnel & contractors	Tiering (all/some/no WFH) | Infra setup (VPN, laptops, desktops) | Broadband availability
		4	Facility & On-site norms	Staggering work shifts/times | Prevention (e.g., Social distancing) | Closures
		5	Health & Govt engagement	Local & federal regulators and public health officials
B	Supply Chain Stabilization	1	Supplier engagement	Cross-tier risk transparency | Supplier restart | Order mgmt. | New supplier qualifications
		2	Inventory management	Critical part identification | Parts rationing | Location optimization
		3	Production & Operations	Operational impact assessment | Production capacity optimization
		4	Demand management	S&OP SKU-level demand signal estimates by macro scenario | Production and sourcing plan
		5	Logistics	Ports | Logistics capacity pre-booking | Route optimization
C	Customer engagement	1	B2B transparency	Comms to B2B customers (e.g., microsite) | Scenario-based risk comms
		2	Customer protection	Prevention interventions across customer journey | Cust. team training | Execution monitoring
		3	Customer outreach	Customer comms re: COVID-practices | Fact-based reports on issues | Situation comms
D	Stress-test financials	1	Scenario definition	Relevant scenarios based on latest epidemiological & economic outlook
		2	Financial stress tests	Financials in different scenarios, especially working capital requirements
E	Operate nerve center	1	Issue map & management	Single source of truth for issue resolution & tapping surge resources where needed
		2	Portfolio of actions	Trigger-based portfolio of actions (across all workstreams above)
		3	Leadership alignment	Align leaders on scenarios | Roundtable exercises

Example Nerve center for a pandemic response

<Real sanitized example>

Executive team

Leadership team

Medical | Security | Response lead

Overall guidelines/ policies

Guides for frontline managers

Medical advisory council

Scenarios

Issue map

Oper cadence

Crisis Nerve Center PMO

Comms+Reg	Colleagues	Supply Chain	Real Estate	Technology	Financial
Regulatory alignment (e.g., dispensations)	Communicate across employee channels	Disruption, restart support (e.g., loans)	Building management	Work from home execution/ infra	Financial stress-testing
3rd party comms (e.g., to partners) as required	2 way feedback (ombuds, survey, email, call)	Exposure across tiers	Factory management	Special employee segment management (e.g., where WFH not possible)	
		Inventory mgmt.			

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

Checklist of things to consider

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

A: Across these areas organizations are taking a range of actions Examples of actions

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

Organizations should consult with official guidelines to establish actions based on the severity or risk of the situation and consult with health professionals

Multiple guidelines are provided by the WHO and CDC

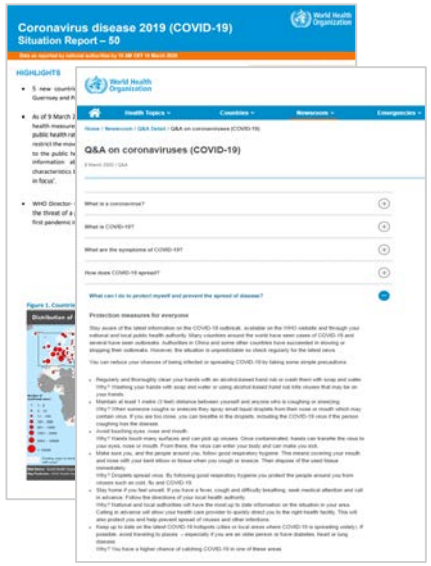
Source: Press search, organization interviews

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
https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200310-sitrep-50-covid-19.pdf?sfvrsn=55e904fb_2

CDC

Overall prevention, business guidance, and industry guidance examples

https://www.cdc.gov/coronavirus/2019-ncov/about/prevention.html
https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fspecific-groups%2Fguidance-business-response.html
https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/prevent-spread-in-long-term-care-facilities.html

Local health authorities & adapted info

Overall information, business guidance, public poster examples

https://www.nhs.uk/conditions/coronavirus-covid-19/
https://www.sfcdcp.org/infectious-diseases-a-to-z/coronavirus-2019-novel-coronavirus/#links-and-documents-public
https://www.cdc.gov/coronavirus/2019-ncov/downloads/sick-with-2019-nCoV-fact-sheet-chinese.pdf

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

B: There are multiple end-to-end immediate supply chain actions to consider in response to COVID-19

Current as of March 16, 2020

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

3 Optimize production and distribution capacity

Assess impact on operations and available resource capacity (mainly workforce)

Ensure employee safety and clearly communicate with employees

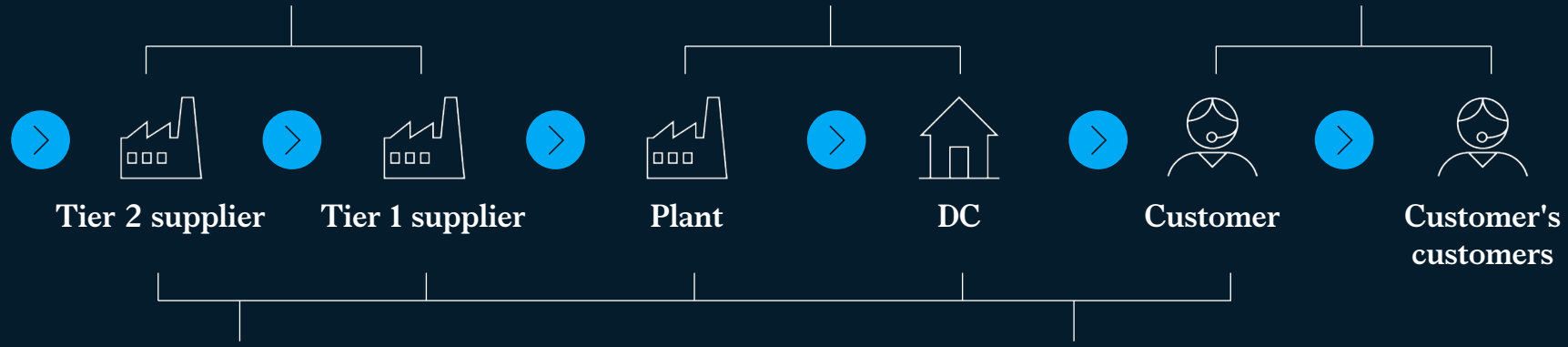
Conduct scenario planning and assess impact on operations based on available capacity

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



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

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

Continuously improve material supply stability

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

Kick off designing resilient supply chain for the future

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

Build collaborative relationships with external partners

Work with public agencies to explore opportunities for support

Engage investors and other stakeholders to improve transparency and get help

Contents

Supply chains are being disrupted around the world, but the but full impacts have not yet been felt

Impact: High, Medium, Low

	Supply – production	Logistics – transportation		Customer demand
Situation today	**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 Index[1] 52% higher since CLNY[3] but at same level as Feb 2019	**60% China flights suspended[5]** Commercial flights account for ~50% of air cargo capacity, some airlines converting flights for cargo[6] **2x TAC index** TAC index rate +98% for US-China, +117% EU-China[2], +21% China-US, and +2% for China-EU since CLNY[3]	**60% truck staff available** 1-14 day quarantine and capacity induced increase in freight transport times **MED** Demand for express last-mile delivery has spiked in China due to quarantine and social distancing	**90% decline in car sales** China consumer sentiment sharply lower; online/express deliveries up **MED** Europe & US sentiments evolving, but localized
What to expect	**MED** Parts and labor shortages leading to further SC disruptions (e.g., decreased production capacity) Other regions will be facing production capacity reductions Customer pressure for prioritization	**7,000 TEU/wk reduction** Volumes will return as factories restart, may see peak for restocks Future capacity 2.3% reduction for a Asia-US route from May due to sea freight alliance revisions **MED** Impact on freight will take an extended period of time to correct with slower ramp-up Logistics capacity returns but faces constraints; near-term price increases	**5% global air traffic decrease[4]** Decline in capacity available due to travel ban on commercial flights YoY global air freight belly capacity reduction of 14% in March 2020[4] Rates likely to continue to increase	**High** Trucking capacity constraints in China likely to ease Declines at US ports foreshadow declines in US intermodal (rail)	**High** Demand slump may persist Inventory “whiplash” - 7-8 weeks for auto, 2-4 weeks for high-tech Inventory hoarding and demand spikes due to uncoordinated actors exacerbate SC

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
3. End of extended Chinese Lunar New Year holiday (2/7-3/13 for BDI, 2/10-3/2 for US-China TAC, 2/10-3/9 for other TAC routes)
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

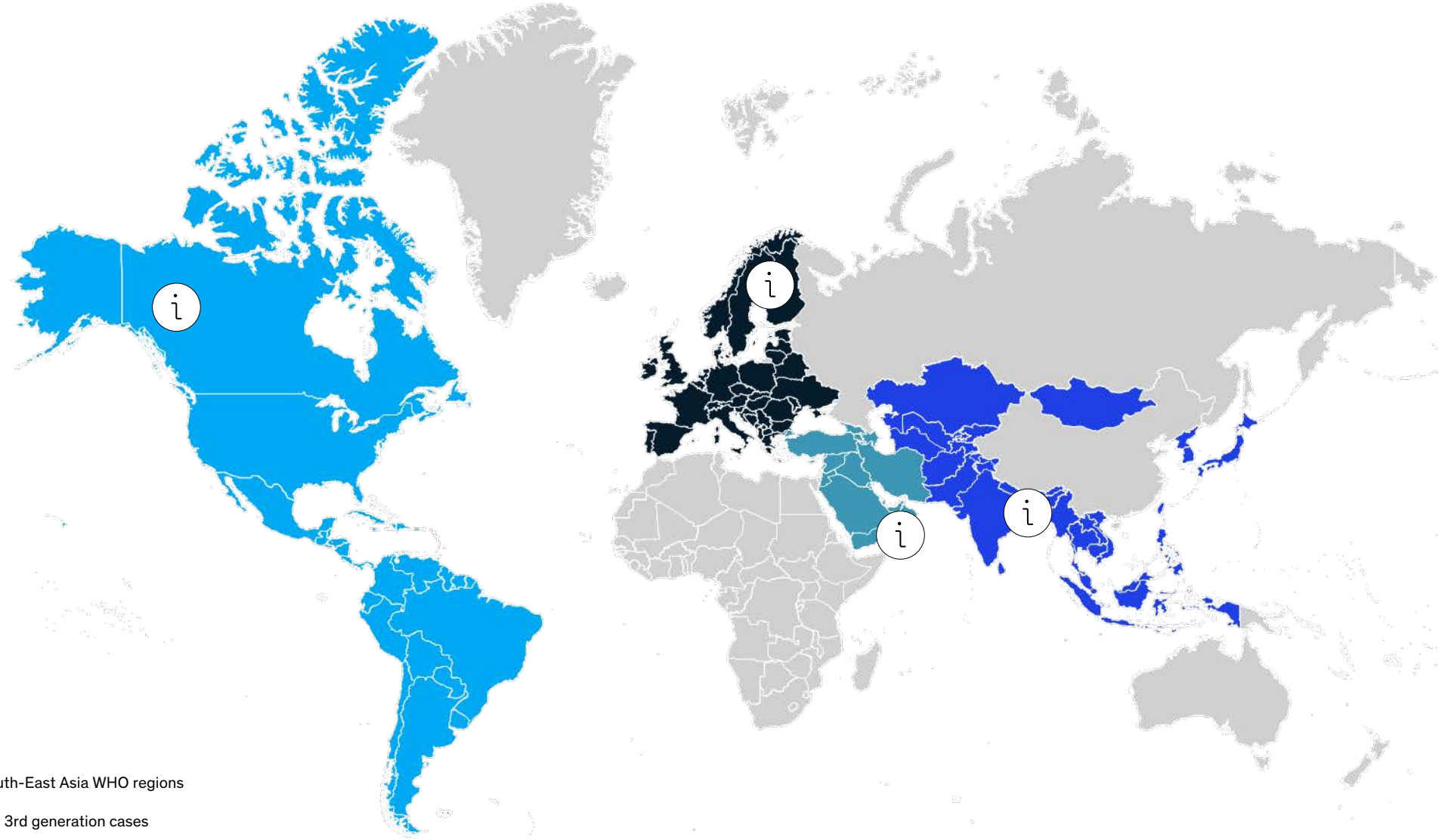
Source: Baidu, WSJ, Bloomberg, Alphaliner, Quartz, TAC index, IATA, Seabury Consulting, A.P. Moller-Maersk Group of Denmark, Agility Logistics

COVID-19 Leading indicator dashboard

Propagation of COVID-19 across new transmission complexes

Click on buttons for more detail

- South-Asia (ex-China)[1]
- Europe
- Middle East[2]
- Americas



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

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

Recovery milestones

Steady decline in confirmed cases

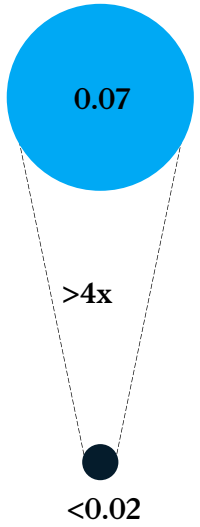
New suspected and confirmed cases rates consistent with other provinces

Quarantine lifted

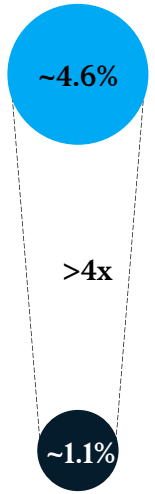
Public transport resumes

Factory activity returns to pre-outbreak levels

Daily infection rate, per million



Crude case fatality ratio[1]



Hubei | China other (avg.)

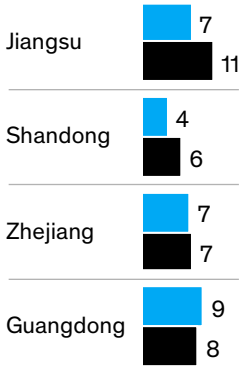
China economic restart

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

Late Q1

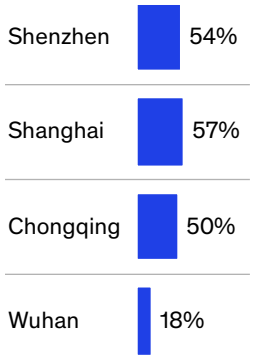
Restart has begun, especially for larger companies, despite challenges such as labor shortages and movement of goods

Labor availability (movement of workers to major industrial provinces)[2]



03/15/2020
Same day 2019

Return to work index (largest manufacturing cities by output in mainland China[3])



03/03/2020

Air pollution (NO_2 level)

32% decline in Beijing[4]

24% decline in Shenzhen[4]

PMI manufact.

14pt decline in Feb

Small businesses face more labor disruption

China consumer confidence

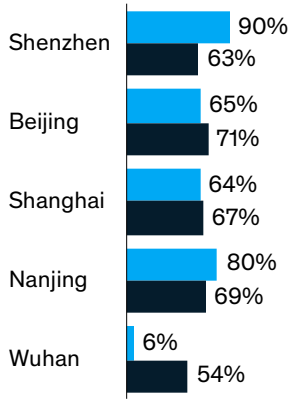
When will Chinese consumer confidence and purchasing activity return?

Q2

Consumer spending in China spend may lag behind economic restart

Tourism and some other sectors impacted well into Q2

Congestion in major cities[5]



03/16/2020
Same day

Earliest school restarts

Started with online lessons
After March 15th
TBD

Example consumer behavior metrics (anecdotal)

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

Middle East

Example country	Epidemiological Indicators[7]						Economic/policy indicators			
	Date of initial case	Total number of cases	New cases in last 14 days	5-day new case trend	Crude case fatality ratio[1]	Peak case count observed?[2]	Number of countries/ territories restricting travel	Number of airlines suspending service to country[3]	Traffic congestion[4]	School closures
Iran	02/20	12,729	12,136	881, 958, 1,075, 1,289, 1,365	4.8%[6]	N	87	x9	**Data N/A**	Country-wide
Rest of region	02/15	1,221	1,108	40, 349, 51, 153, 132	1.2%	N				

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

Stage 5: New cases drop, activity resumes

CDC travel health notice

- Warning Level 3
- Alert Level 2
- None

Traffic congestion[5]

- 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

Europe

Example country	Epidemiological Indicators[7]						Economic/policy indicators				
	Date of initial case	Total number of cases	New cases in last 14 days	5-day new case trend	Crude case fatality ratio[1]	Peak case count observed?[2]	Number of countries/ territories restricting travel	Number of airlines suspending service to country[3]	Traffic congestion[4]	School closures
Italy	01/31	21,157	20,029	977, 2,313, 2,651, 2,547, 3,497	6.8%[6]	N	94	x 18	74, 10	Country-wide
France	01/25	4,469	4,369	372, 495, 591, 780, 829	2.0%	N	55		74, 25	Country-wide
Germany	01/28	3,795	3,738	157, 271, 802, 693, 733	0.2%	N	52		56, 45	Local
Spain	02/01	5,753	5,708	615, 501, 825, 1,266, 1,522	2.4%	N	49		59, 5	Country-wide
Rest of region	01/29	9,900	9,754	877, 1,192, 1,125, 2,086, 2,222	0.6%	N				

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Americas

Example country	Epidemiological Indicators[7]						Economic/policy indicators			
	Date of initial case	Total number of cases	New cases in last 14 days	5-day new case trend	Crude case fatality ratio[1]	Peak case count observed?[2]	Number of countries/ territories restricting travel	Number of airlines suspending service to country[3]	Traffic congestion[4]	School closures
US	01/23	1,678	1,616	224 291 277 414 0[5]	2.4%	N	28		59 16	Local
Rest of region	01/27	699	677	49 16 105 122 245	0.7%	N				

Current phase

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Traffic congestion[5]

- 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

South-Asia (ex-China)

Example country	Epidemiological Indicators[7]						Economic/policy indicators			
	Date of initial case	Total number of cases	New cases in last 14 days	5-day new case trend	Crude case fatality ratio[1]	Peak case count observed?[2]	Number of countries/ territories restricting travel	Number of airlines suspending service to country[3]	Traffic congestion[4]	School closures
South Korea	Prior to 01/20	8,162	4,426	242, 114, 110, 107, 76	0.9%	N	86	x 13	Data N/A	Country-wide
Japan	Prior to 01/20	780	541	54, 52, 55, 41, 64	2.8%	N	48		63, 47	Country-wide
Singapore	01/24	212	110	6, 12, 9, 13, 12	0%	N	42		59, 24	Not noted
Rest of region	Prior to 01/20	1,033	906	87, 61, 30, 206, 241	1.1%	N				

Current phase

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Traffic congestionl[5]

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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
4. Based on representative cities: Tokyo, Singapore, Milan, Paris, Berlin, Madrid, Los Angeles
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