# OLIVER WYMAN

# RESPONDING TO COVID-19

Primer, Scenarios, and Implications

April 3, 2020 UPDATE

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# 01

## EPIDEMIOLOGIC PERSPECTIVES

# INTRODUCTION: COVID-19 PRIMER

**Context and purpose**

The **novel coronavirus has infected hundreds of thousands of people globally and is taking a severe toll on individuals, families, and economies** as productivity drops and stock markets reflect increased global uncertainty

This document provides some b**aseline facts and guidance for business leaders as to critical questions to address in the immediate and near-term** to ensure the continuity of their business and the safety, health, and wellbeing of their workforce and customers

**What is it?**

**COVID-19 is the name for the illness caused by the novel coronavirus** that originated in Wuhan, China in December 2019

It is from the **same family of viruses that cause some common colds**, as well as Severe Acute Respiratory Syndrome (**SARS**) and Middle East Respiratory Syndrome (**MERS**)

It is considered **similar to other respiratory infections such as influenzas**; symptoms range from fever, cough, shortness of breath to more severe cases of pneumonia and organ failure

# COVID-19 SPREAD GLOBALLY

**As of April 3$^{rd}$, 2020**
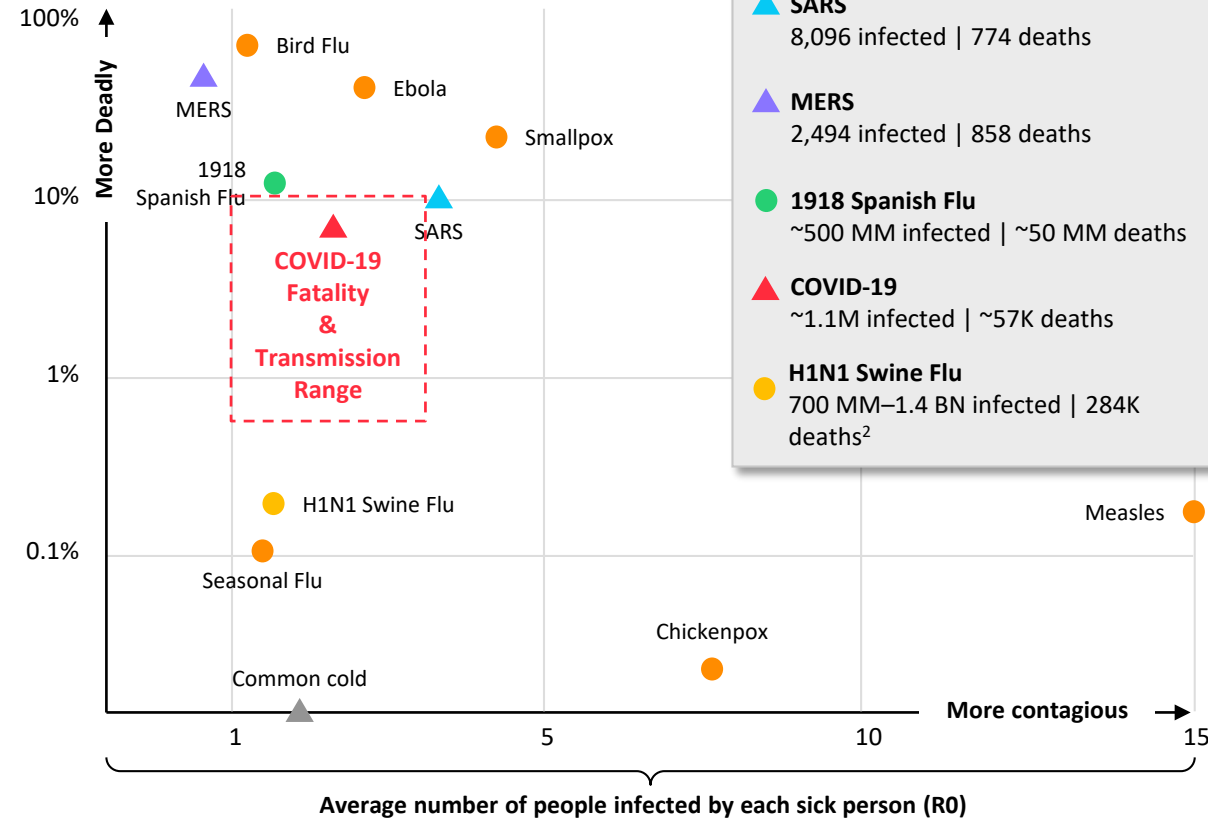- ~1.1M cases reported in 181 countries and territories
- ~57K reported deaths
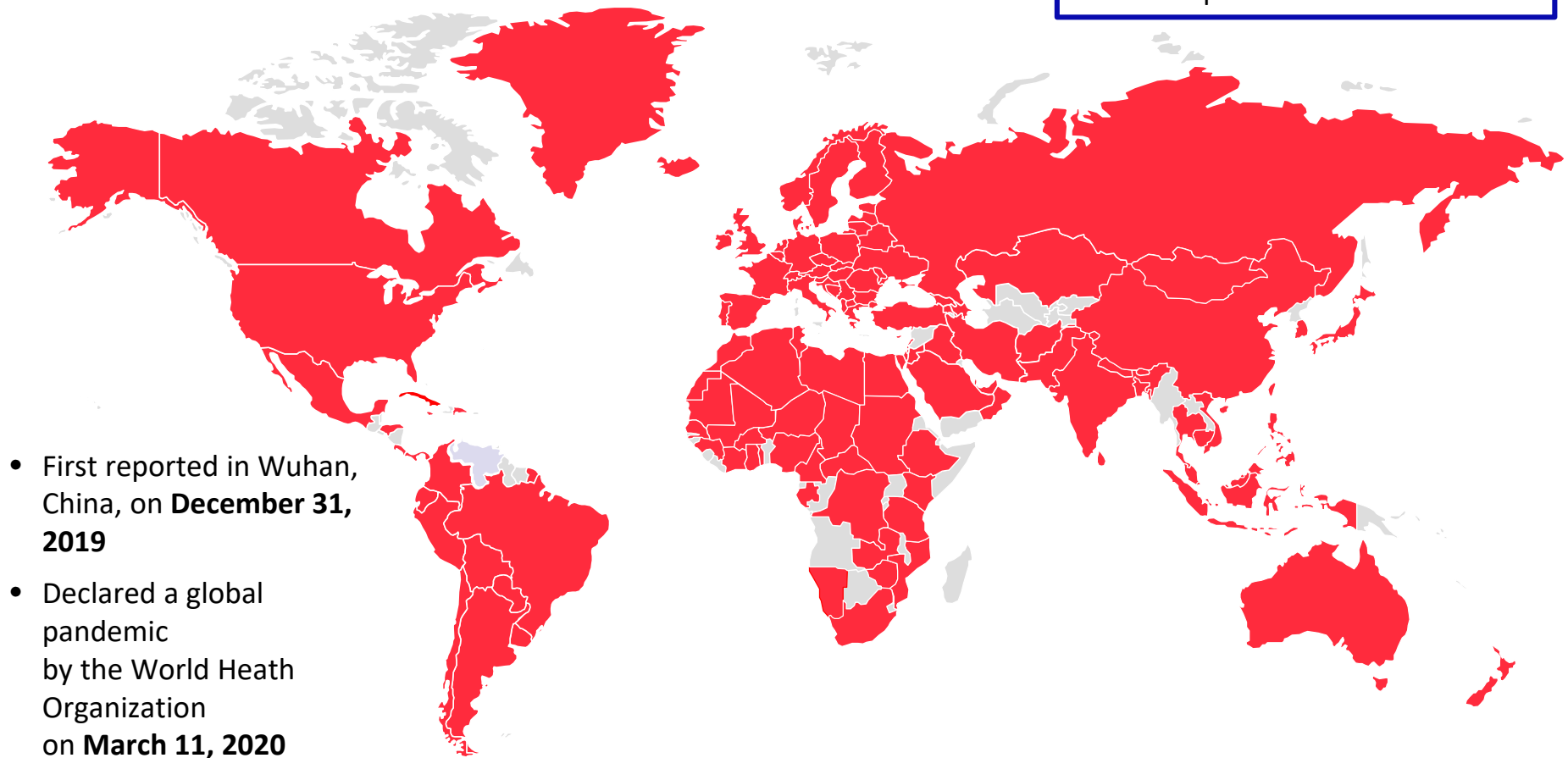
- First reported in Wuhan, China, on **December 31, 2019**
- Declared a global pandemic by the World Heath Organization on **March 11, 2020**

1. Countries included: All Countries in "European Region" Sub-region in WHO Situation Report
Source: Map from CDC (link), Numbers from John Hopkins University & Medicine (link)

# HOW DOES COVID-19 COMPARE TO OTHER DISEASE OUTBREAKS? (1 OF 2)

COVID-19 is currently more deadly that the Flu, but the science on transmission and mortality continues to evolve

**Fatality rate[1]**
Log scale



**Legend and key statistics**

▲ **SARS**
8,096 infected | 774 deaths

▲ **MERS**
2,494 infected | 858 deaths

● **1918 Spanish Flu**
~500 MM infected | ~50 MM deaths

▲ **COVID-19**
~1.1M infected | ~57K deaths

● **H1N1 Swine Flu**
700 MM–1.4 BN infected | 284K deaths[2]

**Average number of people infected by each sick person (R0)**

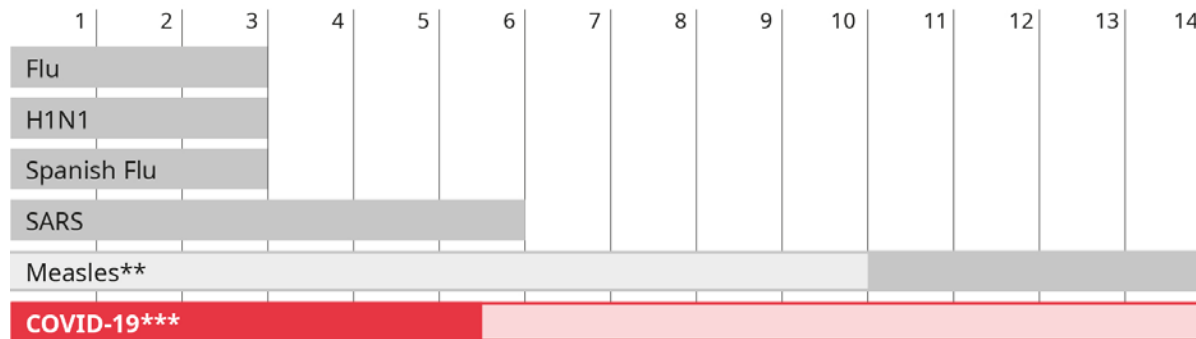▲ **Denotes Coronaviruses**

**Additional details**

- R-naught (R0) represents the number of cases an infected person will cause. R0 for COVID-19 is currently estimated at between 2 and 3 (with edge of range estimates closer to 1.4 and 3.6), which means each person infects 2-3 others[3]; R0 for the seasonal flu is around 1.3[4]

- The global case fatality rate for confirmed COVID-19 cases is currently 5.0%[5] according to WHO's reported statistics versus 0.1% for the seasonal flu; the rate varies significantly by country (e.g., Italy – 12.1%, South Korea – 1.7%[5])

- We expect case fatality rates to fluctuate as testing expands identifying more cases and as existing cases are resolved

1. New York Times (link) for fatality and R-naught comparisons, CDC timelines for case numbers (selected link: CDC SARS timeline); 2. Updated CDC estimates (link); 3. The R0 for the coronavirus was estimated by the WHO to be between 1.4 -2.5 (end of January estimate) (link), other organizations have estimated an R0 ranging between 2-3 or higher (link); 4. CDC Paper (link); 5. Calculated as Number of Deaths / Total Confirmed Cases as reported by John Hopkins University.

# HOW DOES COVID-19 COMPARE TO OTHER DISEASE OUTBREAKS? (2 OF 2)

The infectious cycle of COVID-19 is unlike that of any other outbreak we have seen before

## Incubation Timeline (Days)*, [1]

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flu | | | | | | | | | | | | | | |
| H1N1 | | | | | | | | | | | | | | |
| Spanish Flu | | | | | | | | | | | | | | |
| SARS | | | | | | | | | | | | | | |
| Measles** | | | | | | | | | | | | | | |
| COVID-19*** | | | | | | | | | | | | | | |

*All but SARS have the potential for asymptomatic transmission
**Symptoms most commonly appear on Days 10-14
***The median incubation period for COVID-19 is 5.5 days, but symptoms can develop as late as 14 days post exposure

## Why does this matter?

- The combination of a longer incubation period with asymptomatic transmission means that there is a longer window of time during which infected individuals are unaware that they are contagious

## Why is quarantine 14 days?

- While the median incubation period is 5.5 days, symptoms have been documented to occur over a longer time frame; 14 days should capture 99% of all cases[2]

## What do we still not know?

- We still do not accurately understand the full infectious period for COVID-19

## What we know about the infectious cycle?

- Multiple sources confirm asymptomatic transmission, but the exact timing of when an exposed individual becomes contagious is not known [3, 4, 5]
- Viral loads build rapidly and continue to shed until 6-12 days after symptoms have cleared[6]
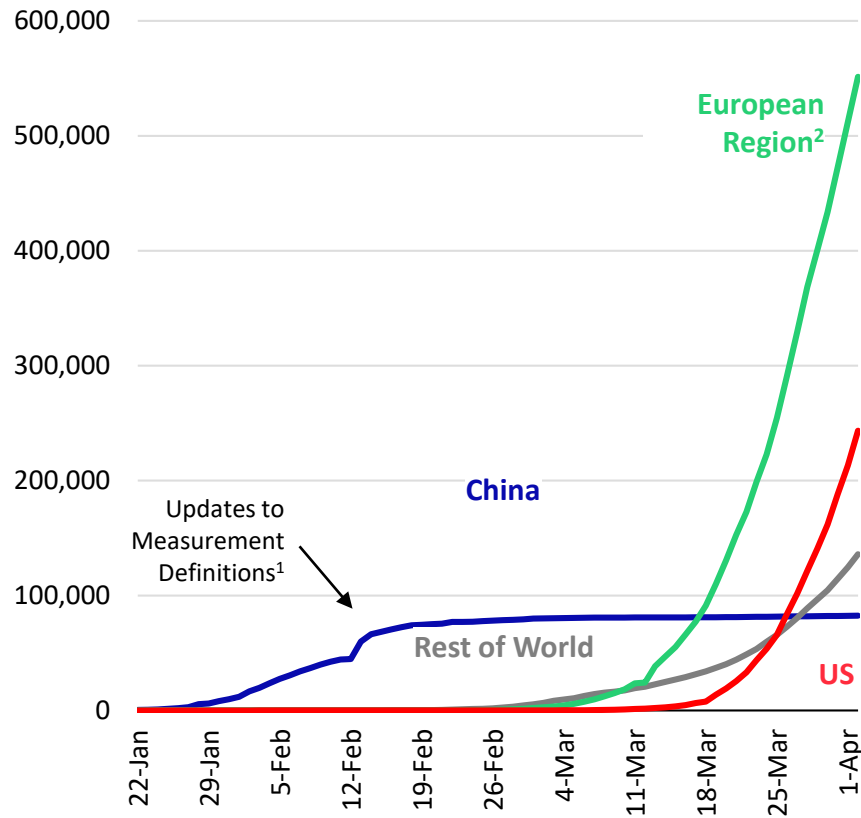
1. CDC 2. Annals of Internal Medicine (link) 3. JAMA (link) 4. NEJM (link) 5. Science (link) 6. medRxiv (link)
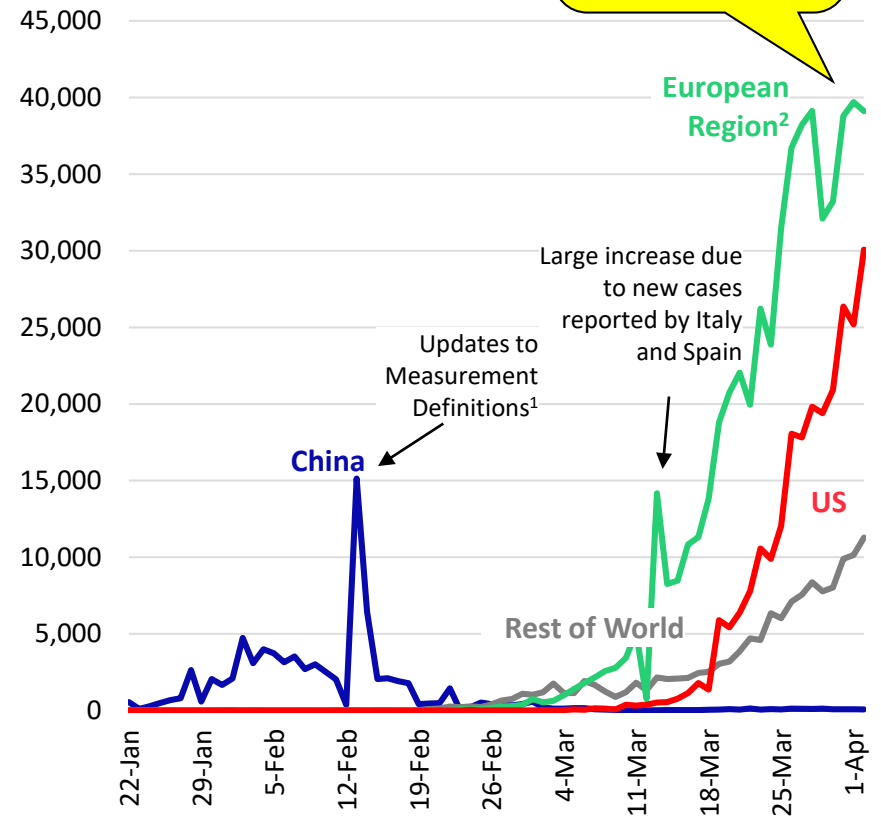
# COVID-19 TRENDS AND SPREAD OF THE DISEASE

The number of new cases in China has slowed – likely due to significant containment measures – as the outbreak spreads to other countries

## Cumulative Confirmed Cases of COVID-19

## New Cases Per Day of COVID-19



Uptick largely driven by increases in Spain, Germany, France, UK as compared to the dip on 3/29

European Region[2]

Large increase due to new cases reported by Italy and Spain

Updates to Measurement Definitions[1]

China

US

Rest of World

Updates to Measurement Definitions[1]

China

Rest of World

US

Source: John Hopkins University & Medicine Coronavirus Resource Centre
1. Until February 17, the WHO situation reports included only laboratory confirmed cases causing a spike in total cases. Some sources include this update as of February 13. The jump due to inclusion of non lab confirmed cases is not included in the new cases data in WHO situation reports.; 2. Includes countries categorized under "European region" based off of latest WHO Situation Reports

# MOST COUNTRIES – INCLUDING THE US – CONTINUE TO SEE EXPONENTIAL GROWTH; CHINA AND SOUTH KOREA HAVE FLATTENED THE CURVE

**Cumulative confirmed cases by country**

Log scale
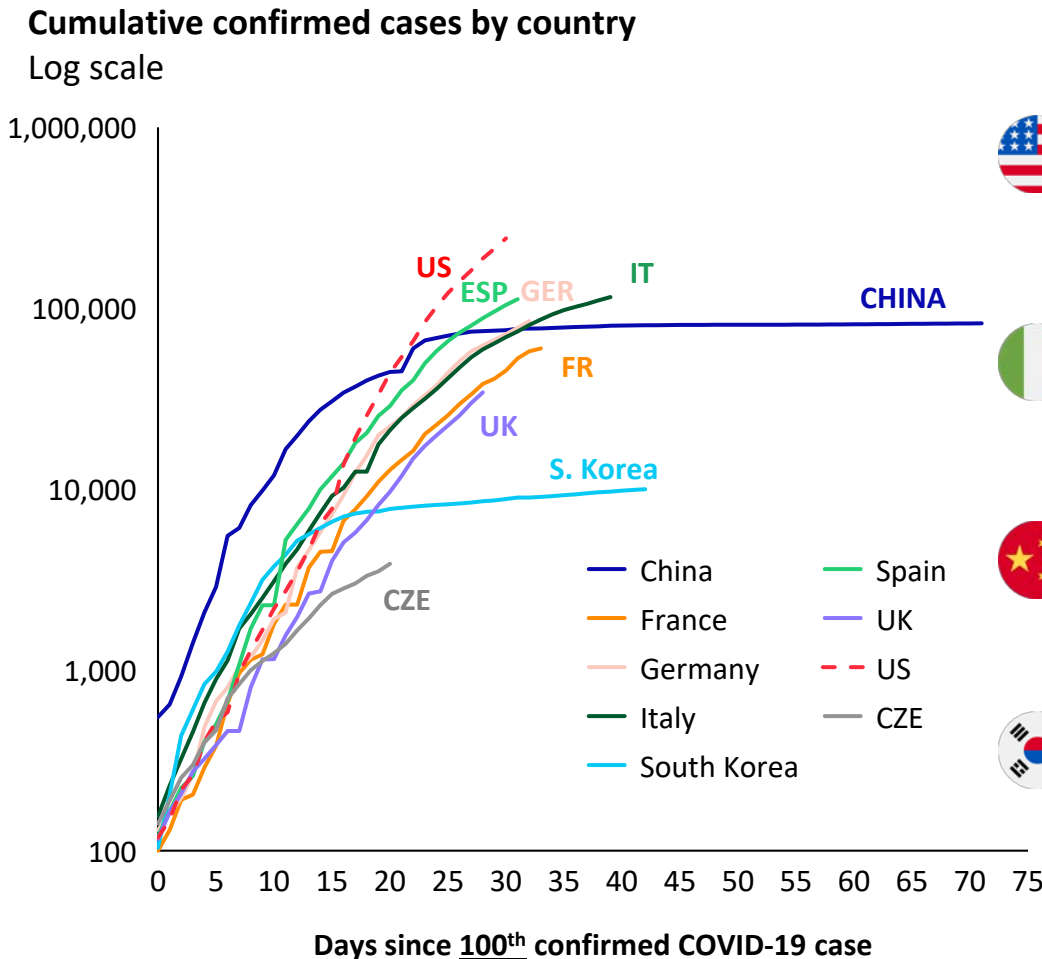


- Lack of broad testing early, followed by rapid ramp-up may explain part of steep growth rate
- Response left largely to individual states
- More than half of states implemented state-wide stay at home orders between March 19 and April 1

- Initial ring-fencing limited to Lombardy, at 8k cases (day 15 in chart), with ongoing travel still permitted
- Broader shutdown at 12k cases (day 17 in chart)

- Enforced city-wide quarantine of Wuhan post-outbreak
- Early containment outside Hubei halted growth
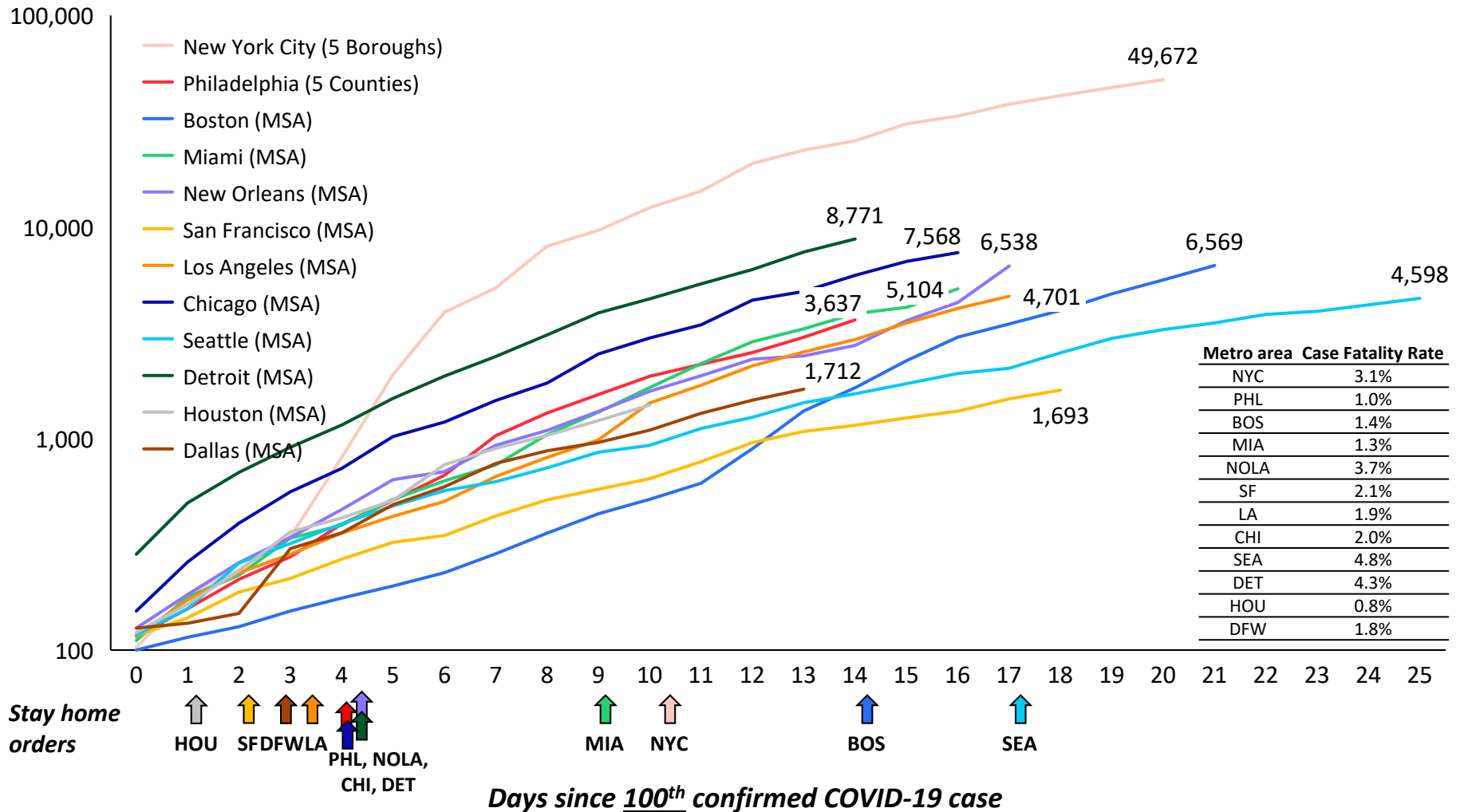- Mobile monitoring / enforcement (via WeChat, etc.)

- Massive early testing (as of 3/28, >6.5k tests per million vs. US estimated ~2k tests per million people)
- Quarantined patients monitored via mobile app
- Epidemic response in place from SARS outbreak

**Days since 100th confirmed COVID-19 case**

Sources: JCSSE (Johns Hopkins), local news and county health departments, as of 3/17. Pre-WHO China data from NHC)  Containment sources: China, S. Korea, US and testing stats, Italy
100th case on: Italy: 2/23, S. Korea: 2/20, US: 3/3, China: before 1/18, UK: 3/5, France: 2/29, Germany: 3/1; Spain 3/2, Czechia: 3/13. Data from JHU 4/2/2020.

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# THE CASE COUNT OF COVID-19 CONTINUES TO GROW ACROSS THE UNITED STATES
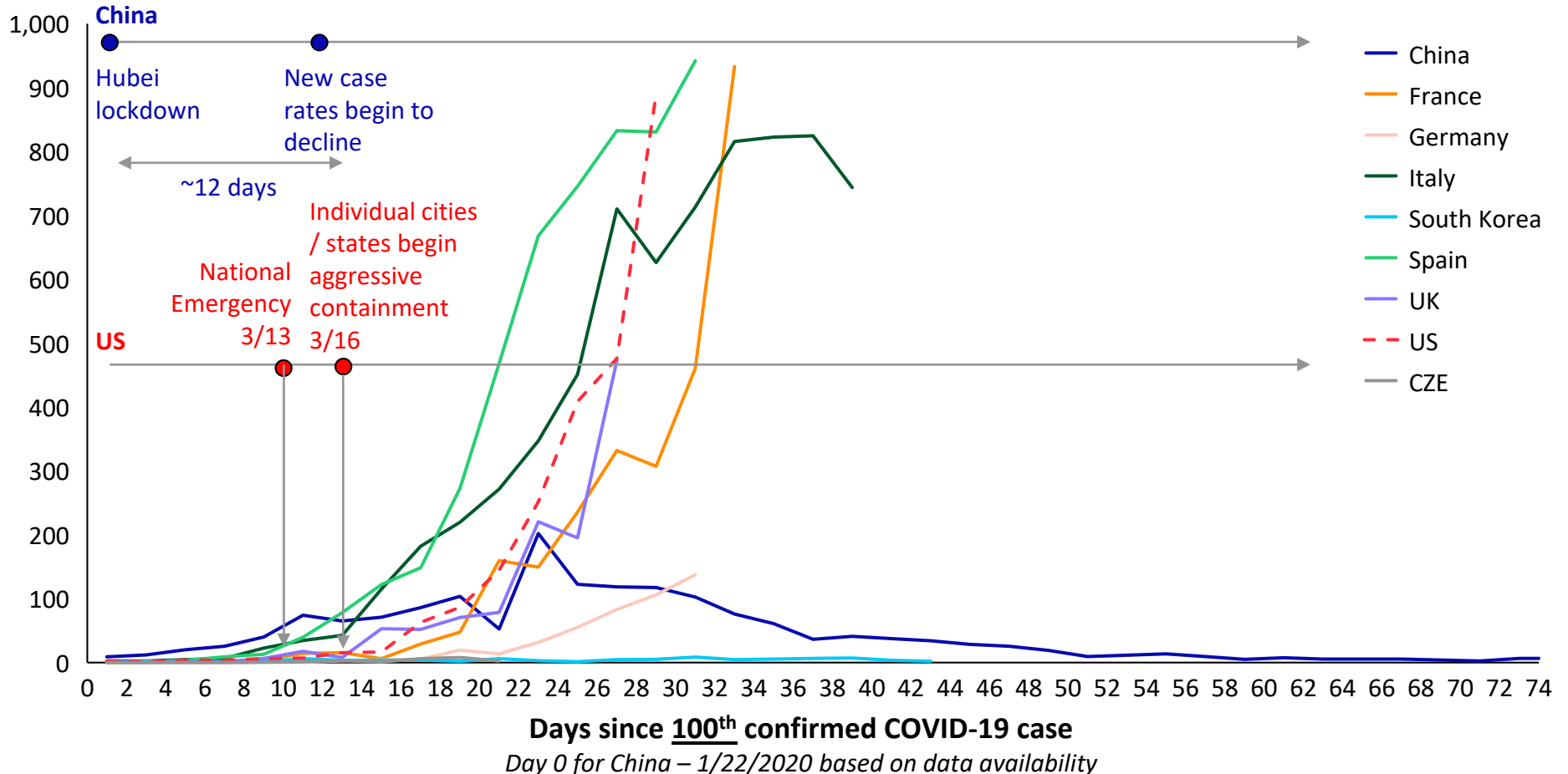
**Confirmed Cases by US Metro area**

Log scale



| Metro area | Case Fatality Rate |
|---|---|
| NYC | 3.1% |
| PHL | 1.0% |
| BOS | 1.4% |
| MIA | 1.3% |
| NOLA | 3.7% |
| SF | 2.1% |
| LA | 1.9% |
| CHI | 2.0% |
| SEA | 4.8% |
| DET | 4.3% |
| HOU | 0.8% |
| DFW | 1.8% |

*Days since 100th confirmed COVID-19 case*

Data: USA Facts County Level Data as of 4/2/2020. Stay at home orders data from New York Times.

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# COVID-19 TRENDS AND SPREAD OF THE DISEASE

Daily death rates indicate that suppression, aggressive testing, and active tracing / isolation strategies (as seen in countries like South Korea) can effectively ease the burden on the healthcare system, leading to lower death rates
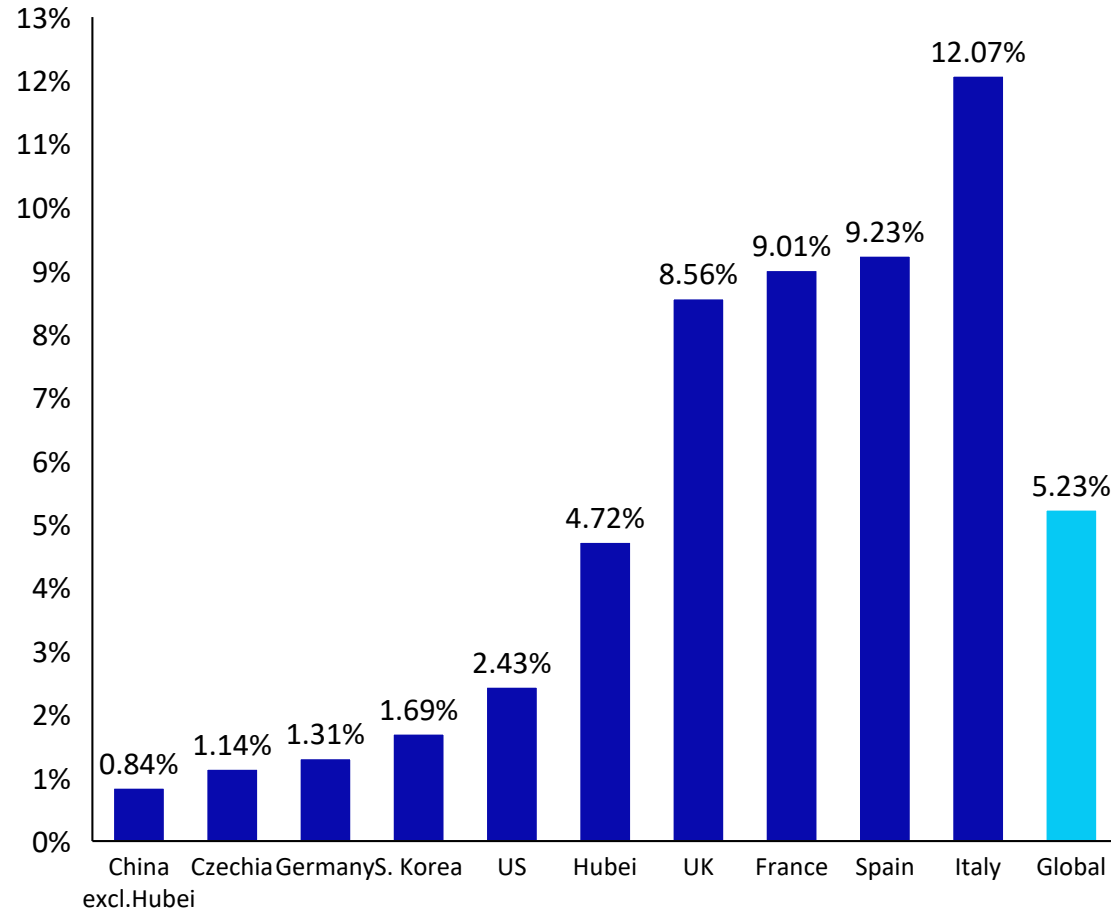
**Number of daily COVID-19 deaths by country**



**Days since 100th confirmed COVID-19 case**

*Day 0 for China – 1/22/2020 based on data availability*

Source: John Hopkins University & Medicine Coronavirus Resource Centre
100th case on: Italy: 2/23, S. Korea: 2/20, US: 3/3, China: before 1/18, UK: 3/5, France: 2/29, Germany: 3/1; Spain 3/2. Czechia 3/13. Data from JHU.

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# CASE FATALITY RATE (CFR) BY COUNTRY

While the global CFR is a useful metric to understand COVID-19, country-specific CFRs range by an order of magnitude

**CFR by country[1]**



| Country | CFR |
|---|---|
| China excl. Hubei | 0.84% |
| Czechia | 1.14% |
| Germany | 1.31% |
| S. Korea | 1.69% |
| US | 2.43% |
| Hubei | 4.72% |
| UK | 8.56% |
| France | 9.01% |
| Spain | 9.23% |
| Italy | 12.07% |
| Global | 5.23% |

**What is driving the variation?**

- **Position along the trajectory of the outbreak:** For many countries (e.g., Europe, US), the vast majority of cases have not yet resolved and the CFR is changing rapidly

- **Breadth of testing:** Broader testing leads to a larger confirmed base of patients, decreasing CFR

- **Distribution of key risk factors within the population:** Age, gender and pre-existing conditions have a significant influence on mortality (see next page); countries with higher CFRs have a population skewed towards these risk factors (e.g., Italy has the second oldest population on earth)

- **Health system threshold:** Every country has a health system capacity, that when exceeded, will result in the inability to provide sufficient support to all patients thereby resulting in a higher CFR

Note that case fatality rates are still unstable as greater than 80% of cases outside of China are still active
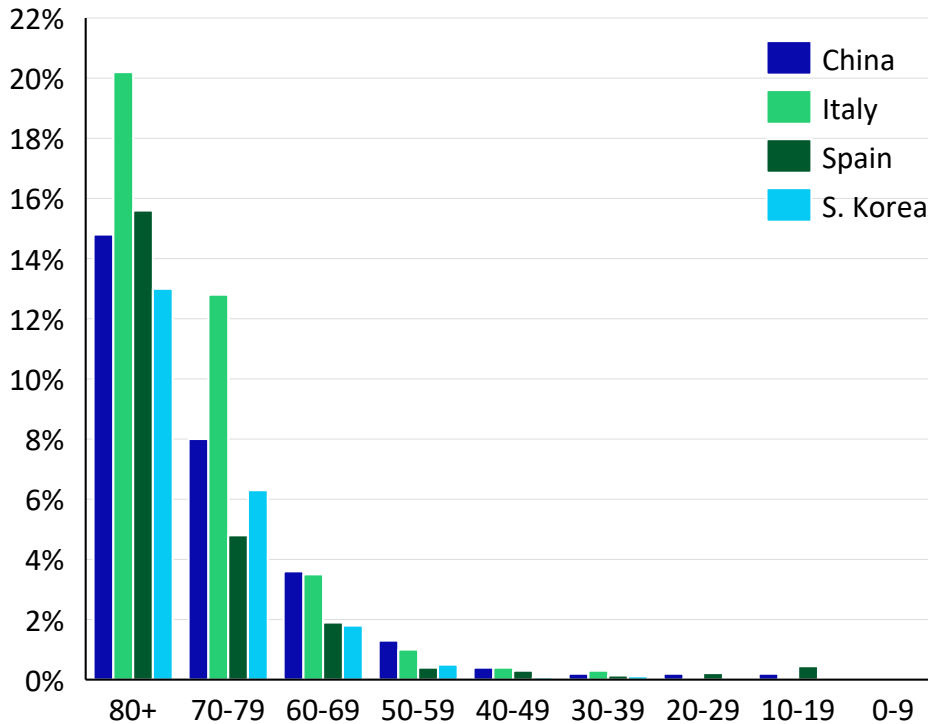
1. Calculated as Number of Deaths / Total Confirmed Cases as reported by Johns Hopkins University

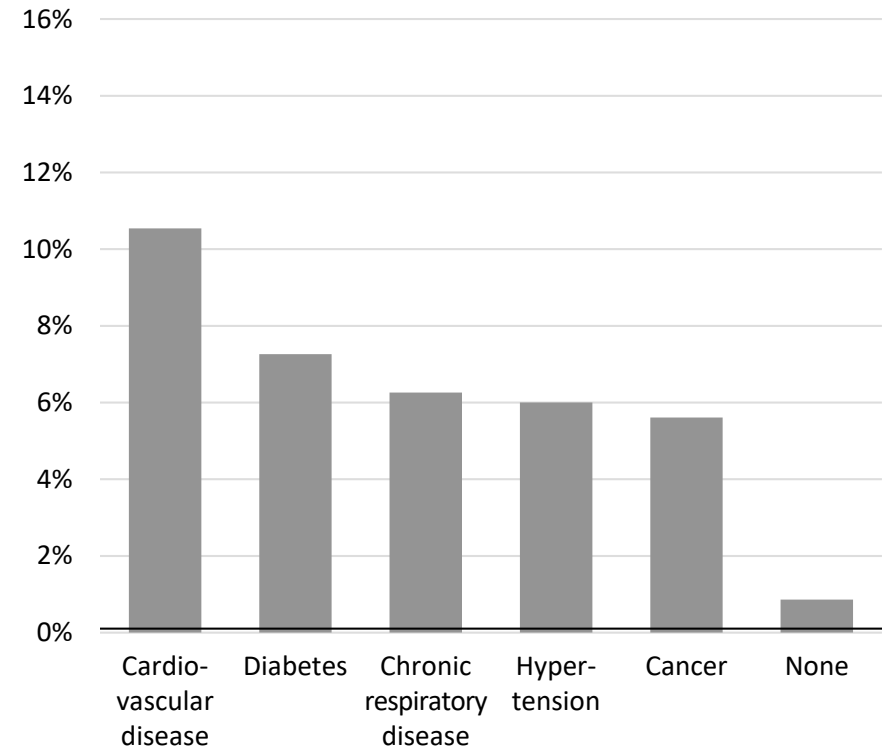# CASE FATALITY RATE (CFR) BY PATIENT CHARACTERISTIC

Significantly higher death rates occur among the elderly and those with underlying conditions

## Case Fatality Rate by Specific Patient Characteristics

**by Age[1,2,3]**

**by Comorbid Condition[1]**

# SUMMARY UNDERSTANDING OF COVID-19 FACTS

| | Key facts | Implications |
|---|---|---|
| **Contagion** | • R0 for COVID-19 is currently estimated at between 2 and 3 (with edge of range estimates closer to 1.4 and 3.6), which means **each person infects 2-3 others**[3]; R0 for the seasonal flu is around 1.3[4] | COVID-19 is twice as contagious as the seasonal flu |
| **Current human immunity** | • No herd immunity exists yet as **the virus is novel in humans** | Social distancing (quarantines, WFH, school closures) is the only "brake" to slow the spread |
| **Incubation period** | • **The incubation period is a median of 5.5 days (up to 14 days)**[1, 10], while the annual flu is commonly a 3-day period[1]; data suggests that viral shedding continues beyond symptom resolution[6] | People are contagious for longer periods than the flu or other illnesses, requiring longer bouts of quarantine to truly suppress spread |
| **Fatality** | • **Case fatality rates are trending at 5.2% globally**[8] (vs. 0.1% for the flu)[9] | Fatality is orders of magnitude higher than typical influenzas |
| **Portion of cases asymptomatic but contagious** | • COVID-19 can be **spread asymptomatically**[5]<br>• Of those people tested and confirmed positive for COVID-19, experts estimate **18-30% are asymptomatic**, with another 10-20% with mild enough symptoms to not suspect COVID-19[11]<br>• Early indicators from comprehensive testing of small populations (e.g., Vo, Italy; Iceland) **suggest as many as 50% of cases could be asymptomatic**[12] | People who feel "fine" are capable of – and are -- transmitting COVID-19 to others |
| **Portion of cases reaching "critical" / "severe" infection** | • Approximately **19% of confirmed cases are considered "severe" or "critical", requiring hospitalization,** and 1/4th of those need ICU beds[7] | Hospital systems risk being overtaxed (ICU beds, ventilators, PPE) meaning case fatality rates could rise further |

1. CDC. 3. The R0 for the coronavirus was estimated by the WHO to be between 1.4 -2.5 (end of January estimate) (link), other organizations have estimated an R0 ranging between 2-3 or higher (link); 4. CDC Paper (link); 5. JAMA. "Presumed Asymptomatic Carrier Transmission of COVID-19" 6. MedRxlv. "Clinical presentation and virological assessment of hospitalized cases of coronavirus disease 2019 in a travel-associated transmission cluster". Mar 8. 2020. 7. China CDC, JAMA (link). 8. JHU. 9. CDC. 10. Annals of Internal Medicine (link)  11. Nature article (link), Eurosurveillance Paper (link) 12. ZMEScience report (link)

# 02

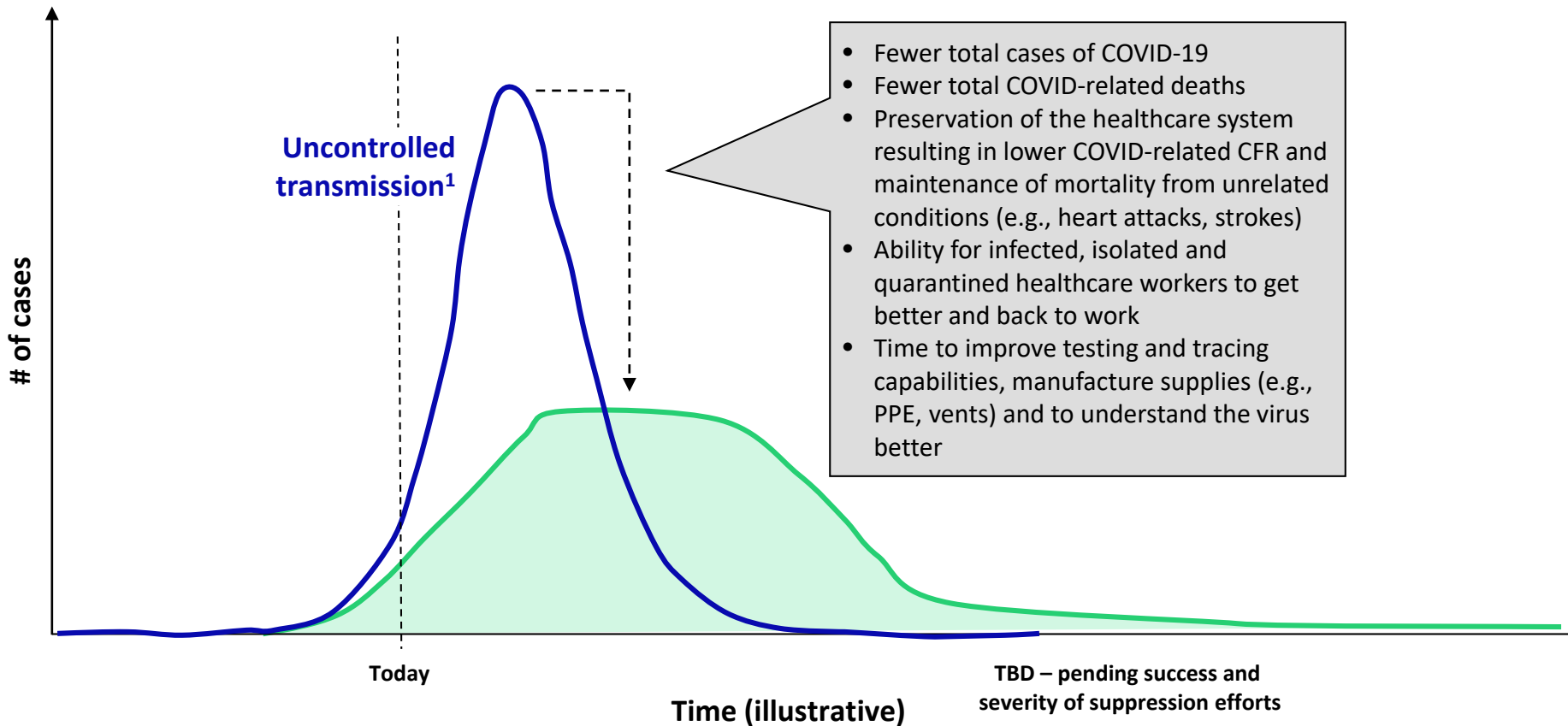## PERSPECTIVES ON MITIGATION OF THE OUTBREAKS

# HOW CAN SUPPRESSION MEASURES LOWER THE BURDEN OF THE PANDEMIC?

Leaving the disease unconstrained is not an option; aggressive suppression measures, can ease the impact of the disease on health systems

**Illustrative COVID-19 transmission with and without suppression measures**
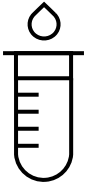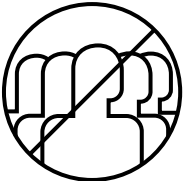Timing and width of peaks may vary between countries



**Uncontrolled transmission[1]**

**# of cases** (y-axis)

**Today**

**Time (illustrative)** (x-axis)

**TBD – pending success and severity of suppression efforts**

- Fewer total cases of COVID-19
- Fewer total COVID-related deaths
- Preservation of the healthcare system resulting in lower COVID-related CFR and maintenance of mortality from unrelated conditions (e.g., heart attacks, strokes)
- Ability for infected, isolated and quarantined healthcare workers to get better and back to work
- Time to improve testing and tracing capabilities, manufacture supplies (e.g., PPE, vents) and to understand the virus better

# WHAT LEVERS CAN HELP SUPPRESS THE PANDEMIC?

Two approaches to initial suppression exist; but given the progression of the disease and the currently available tools the only current option for most countries/ regions is aggressive social distancing
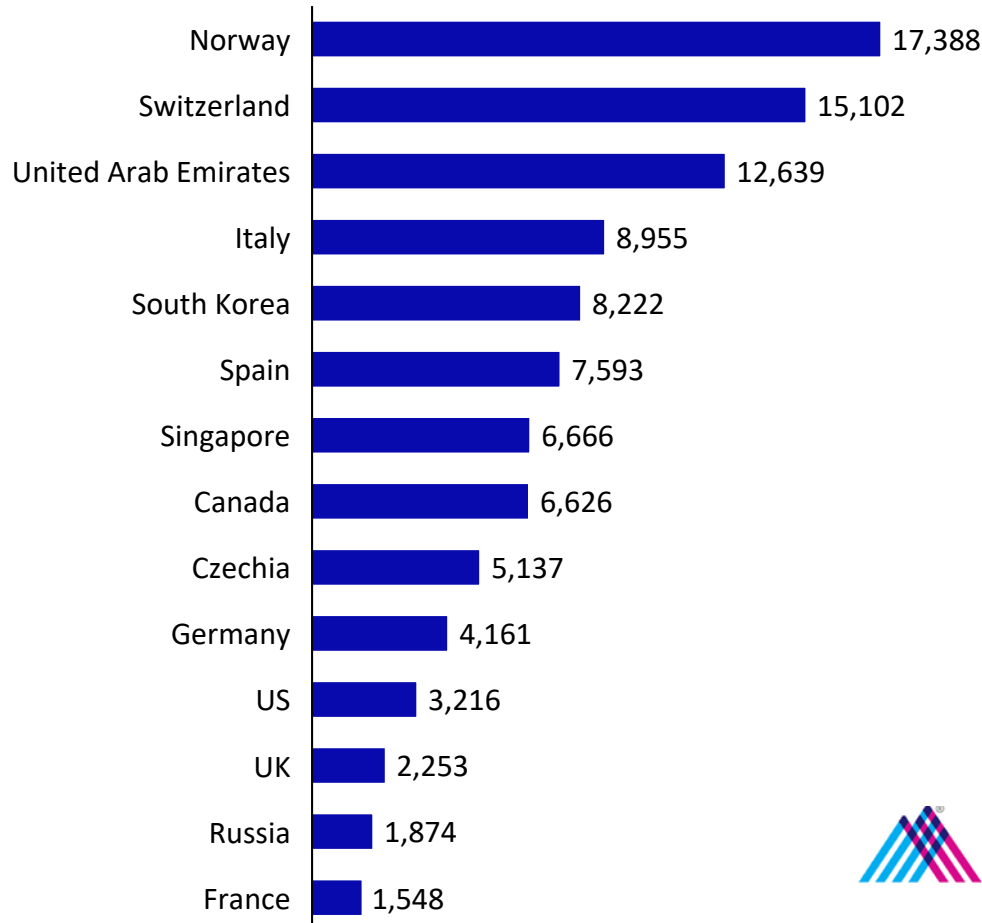
| Levers in response to pandemic[1, 2, 3] | Outcomes | Requirements for success |
|---|---|---|
| **Testing, contact tracing and quarantine of infected** | • Delays or prevents full scale outbreak<br>• Demonstrated to work successfully in S. Korea, Taiwan and China outside of Hubei | • **Early initiation:** In order to use this lever to prevent an outbreak, the methodology needs to be applied as soon as cases are identified (e.g., S. Korea implemented nearly immediate action after initial case was identified on 01/20/20[4])<br>• **Robust capabilities:** Broad testing capacity with rapid results, sophisticated contact tracing and sufficient control over population to ensure quarantine compliance |
| **Aggressive social distancing of entire population** | • Decreases R0 of the virus, decreasing daily growth rates and flattening the peak of cases<br>• Demonstrated to work successfully in Wuhan | • **Decisive, early action:** 'Wait and see' or fragmented approaches only worsen outcomes<br>• **Comprehensive plan:** Closing bars, schools, restaurants, gyms, churches to maintain social distancing, restricting non-essential travel and quarantining all infected patients including asymptomatic ones<br>• **Compliance (enforced if necessary):** Experience in the US and Europe demonstrates that lack of compliance worsens outcomes |

# IN ANY SUPPRESSION APPROACH, TESTING IS A CRITICAL COMPONENT OF A SUCCESSFUL STRATEGY TO PINPOINT INFECTION AND UNDERSTAND SPREAD

**Total COVID-19 tests performed per million people[1]**

| Country | Tests per million |
| --- | --- |
| Norway | 17,388 |
| Switzerland | 15,102 |
| United Arab Emirates | 12,639 |
| Italy | 8,955 |
| South Korea | 8,222 |
| Spain | 7,593 |
| Singapore | 6,666 |
| Canada | 6,626 |
| Czechia | 5,137 |
| Germany | 4,161 |
| US | 3,216 |
| UK | 2,253 |
| Russia | 1,874 |
| France | 1,548 |

**COVID-19 testing news**

> **'A game changer': FDA authorizes Abbott Labs' portable, 5-minute coronavirus test the size of a toaster**
> USA Today, 3/30/20

- Abbott and Cepheid are two medical device and diagnostics companies with recent FDA-approved rapid COVID-19 tests, returning results in <1 hour[2]

Cepheid
A better way.

Abbott

> **The next frontier in coronavirus testing: Identifying the full scope of the pandemic, not just individual infections**
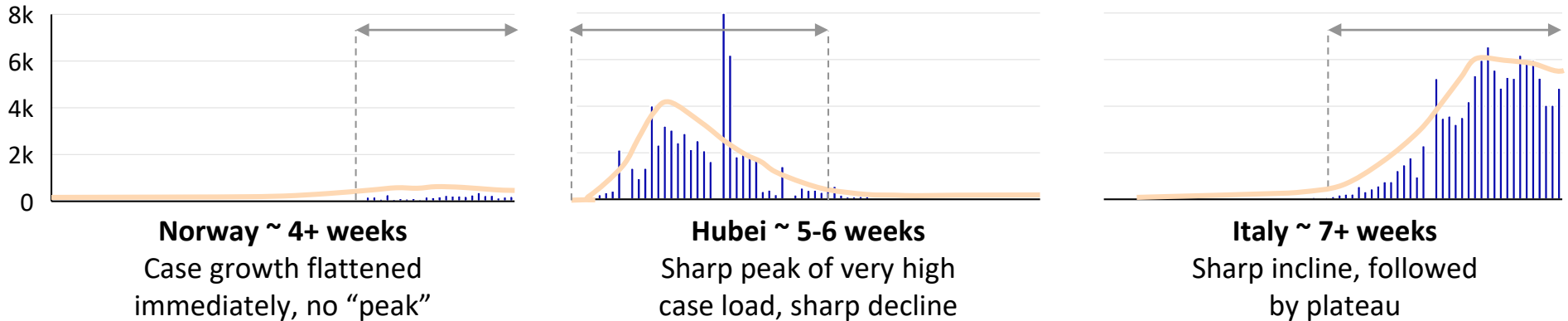> STAT News, 3/27/20

Mount Sinai

- Research institutions such as the Icahn School of Medicine at Mount Sinai are working to design tests which detect antibodies to the new virus in blood in order to understand how far the population is toward herd immunity

# HOW LONG WILL SUPPRESSION TAKE? HOW WILL IT PLAY OUT?

Several archetypes of local pandemic progression patterns have emerged

**Local pandemic progression archetypes[1]**



**Norway ~ 4+ weeks**
Case growth flattened
immediately, no "peak"

**Hubei ~ 5-6 weeks**
Sharp peak of very high
case load, sharp decline

**Italy ~ 7+ weeks**
Sharp incline, followed
by plateau

**Business implications are similar across archetypes, with deepening severity associated with longer suppression timelines:**

- Demand impact uneven across industries; **highest impact to industries that require (or are strongly linked to) in-person consumption** (e.g., retail, transportation, entertainment, accommodation)

- **Multiple global supply chains continue to be disrupted** as local limitations will be placed and lifted at different points in time resulting in global logistics and manufacturing capacity ramping-up unevenly

- **Earnings down for at least 1-2 quarters post outbreak** with gradual recovery and rebounding consumer confidence allowing companies to return to normal 2-4 quarters later

- Despite near-term critical care needs for COVID treatment, **overall health care utilization is expected to fall** due to provider policy, government actions, and individual behaviors; post-pandemic, demand is expected to return, though timing and degree is uncertain

- **Small local businesses** (e.g., restaurants, gyms, salons) **struggle to tread water** during suppression measures, some do not reopen

- **Significant increase in unemployment** ranks across hard hit industries with some re-purposing possible to serve crisis needs (e.g., tracking of cases, public health workforce to trace cases) but 'matching' is complex and challenging

- **Central bank intervention and government stimulus implemented**

1. Archetype charts are derived from real data as reported by Johns Hopkins University spanning 01/22/2020-04/01/2020. Bars represent new confirmed cases by day. Grey arrows symbolize time span from ramp-up of new case load to point of control and are approximate

# OUR SCENARIO FORECAST GENERATOR HELPS TO QUANTIFY SCENARIOS FOR INDIVIDUAL GEOGRAPHIES

The model paints the picture of the "book-end" scenarios and a range of trajectories in between and is now incorporated into our hospital supply and demand model

## OW COVID-19 Scenario Generator

**Modeling Assumptions**

| | | |
|---|---|---|
| Current Number of Confimed Cases | 476 | Current number of Confimed Cases for forecast region |
| Delay Until Containment Effort Starts (days) | 7 | Estimated days until increased containment measures are implemented |
| Expected Effectiveness of Containment Effort | Medium | Expected levels of containment measures (testing, social distancing, quarantines) |
| Current Daily Growth Rate in Cases | 50% | s is ideally calculated as: (Confirmed Cases(day)/Confirmed Cases(prior day)) - 1. If data are not available, see |

**Scenario Output**

| Case Type | Today | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 |
|---|---|---|---|---|---|---|---|---|---|
| Cumulative Confirmed Cases | 476 | 5,698 | 39,479 | 128,744 | 243,284 | 340,545 | 406,033 | 444,917 | 466,518 |
| New Confirmed Cases | | 5,222 | 33,782 | 89,264 | 114,540 | 97,261 | 65,488 | 38,884 | 21,601 |

**COVID Confirmed Case Forecast**

Cumulative Confirmed Cases  — New Con...
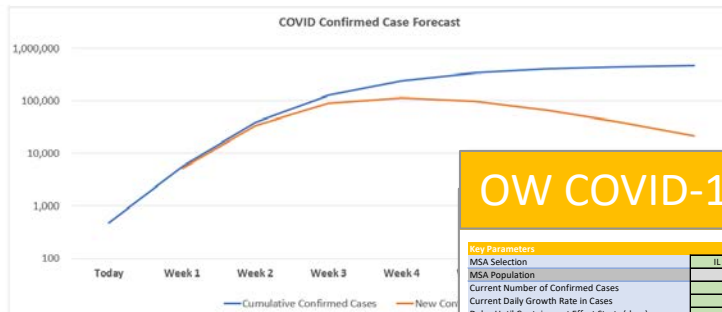
Oliver Wyman created a model to forecast the number of confirmed cases in a region or area based on the starting number of cases, daily case growth rates, the speed with which officials move to enact containment measures, and the effectiveness of those measures.
The model has been applied to forecast scenarios for hospital capacity in US geographies.
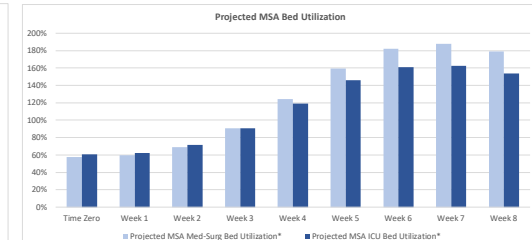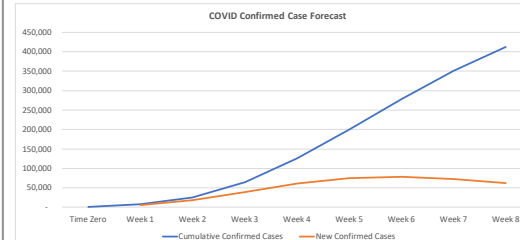Link to the model can be found at
https://oliverwymangroup.wufoo.com/forms/s12hwj5h0qqcxx1/

## OW COVID-19 US Hospital Supply / Demand Model

**Key Parameters**

| | | |
|---|---|---|
| MSA Selection | IL - Chicago | For custom market definition, select "Custom Market" and adjust Counties to include / exclude in Column G in "County Summary" tab |
| MSA Population | 9,679,808 | |
| Current Number of Confirmed Cases | 1,500 | Current number of Confimed Cases for forecast region |
| Current Daily Growth Rate in Cases | 30% | This is ideally calculated as: (Confirmed Cases(day)/Confirmed Cases(prior day)) - 1. If data are not available, see guiding logic on the right |
| Delay Until Containment Effort Starts (days) | 7 | Estimated days until increased containment measures are implemented |
| Expected Effectiveness of Containment Effort | Low | See text box to the right for further explanation. Recent trends for most markets in the US, as well as most democratic countries abroad, follows the Low containment growth path |
| Include Children Hospital Bed Capacity? | No | |

**Baseline MSA Capacity & Utilization**

| | User Input | | Default Values | | |
|---|---|---|---|---|---|
| | Med-Surg Beds | ICU Beds | Med-Surg Beds | ICU Beds | |
| Average Free Beds | 7,141 | 970 | 7,141 | 970 | |
| Average Occupied Beds | 9,759 | 1,500 | 9,759 | 1,500 | Occupied beds and average utilization is estimated for steady state (pre-COVID-19) |
| Total Beds | 16,900 | 2,470 | 16,900 | 2,470 | |
| Average Utilization Rate | 58% | 61% | 58% | 61% | |

**Note: You must input both Avg. Occupied Beds and Total Beds to override Default Values**

**Scenario Output Graphs**

**COVID Confirmed Case Forecast**

Cumulative Confirmed Cases  — New Confirmed Cases

**Projected MSA Bed Utilization**

Projected MSA Med-Surg Bed Utilization*   Projected MSA ICU Bed Utilization*

# WHAT HAPPENS ONCE THE LOCAL OUTBREAK IS SUPPRESSED?  WHEN AND HOW DO WE RESTART THE LOCAL ECONOMY?

## WHEN?

1. **Existing outbreak is under control**
   - Number of **new cases per day declining consistently** for a minimum of 14 days
   - **Hospitals can safely treat all admits** (COVID-19 or otherwise) without crisis care standards

2. **Have the tools to maintain suppression**
   - **Broad testing and data monitoring capabilities**
     - Widespread and rapid testing at POC
     - Broad serologic testing of population (data from South Korea suggests breadth of testing such that positives do not exceed 5%)
     - Comprehensive National surveillance system to track rate of infection and identify community spread early enough that case-based interventions can prevent a larger outbreak
   - **Scaled contact tracing and enforceable isolation and quarantine**
     - Isolation of infected individual (home or hospital)
     - Close contacts quarantined and monitored
     - International travelers quarantined and monitored

## HOW?

1. **Implement case-based interventions**
   - Ensure that all confirmed cases are isolated
   - Isolate and quarantine any contacts of confirmed cases
   - Recommend quarantine for any individuals awaiting test results

2. **Begin to relax physical distancing measures gradually**
   - Maintain heightened hygiene and general physical distancing recommendations
   - Maintain telework where feasible without disruption
   - Initially limit social interactions to below 50, then 500
   - Use a test and learn approach on removing aggressive measures (e.g., closing schools, closing restaurants / bars, closing of non-essential businesses, banning sporting events)
   - Use real time (or nearly so) data to evaluate impact of individual measures on decreasing disease spread

3. **Protect high risk populations**
   - Continue stringent social distancing for aged and those with pre-existing conditions or weakened immune function
   - Ensure high levels of infection prevention in nursing homes and Long Term Care Facilities

# HOW AND WHEN WILL WE RECOVER COMPLETELY?

A successful vaccine manufactured and deployed at scale is the only certain path to eradication

## How long could that take?

- In short, 18+ months is likely for development, trials, approval and mass production

- The best comparison we have is the development of H1N1 vaccines under similar circumstances:

---

**H1N1[1]**

6 months until vaccine approval; 12 months critical conditions; 18 months until end of pandemic

| MAR 2009 | APR 2009 | Summer 2009 | July 2009 | Sep 2009 | Aug 2010 |
|----------|----------|-------------|-----------|----------|----------|
| First world-wide case emerges | US Gov declares state of emergency | Source region possibly under control | Vaccine clinical trials begin | FDA approves four H1N1 vaccines | WHO declares end of pandemic |

---

## What is the current status?

- Several vaccine types could be considered for COVID-19: **1) traditional protein-based** (longer development, manufacturing timeframe but proven approach), **2) mRNA-based** (quick to design but less proven technology and efficacy, **3) DNA-based** (quick to design but less proven technology)

- At the outset of the pandemic, multiple biotechs have moved to create a COVID-19 vaccine – the first out of the gate are mRNA varietals

  - **Moderna**, a biotech, is the first to have launched clinical testing of an mRNA vaccine in humans on 3/16/20 – but has not yet partnered with a larger, scaled PharmaCo

  - **Pfizer and BioNTech** have partnered to test another mRNA vaccine starting in in late April 2020

## What are the key issues (aside from the science of producing an effective vaccine)?

- **Large-scale manufacturing capacity** would be needed and is not readily available/scalable (GSK Shingrix example demonstrates multi-year lag between vaccine approval and production scale)

- **Timelines to produce required safety and efficacy clinical trial results** estimated to take 12-18 months, even if 'fast tracked'

Sources: H1N1 timeline (link) and Credit Suisse Equity Research
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# IS THERE ANYTHING THAT MIGHT IMPROVE THIS TIMELINE?

Therapeutics or a virulence-reducing mutation could speed up eradication

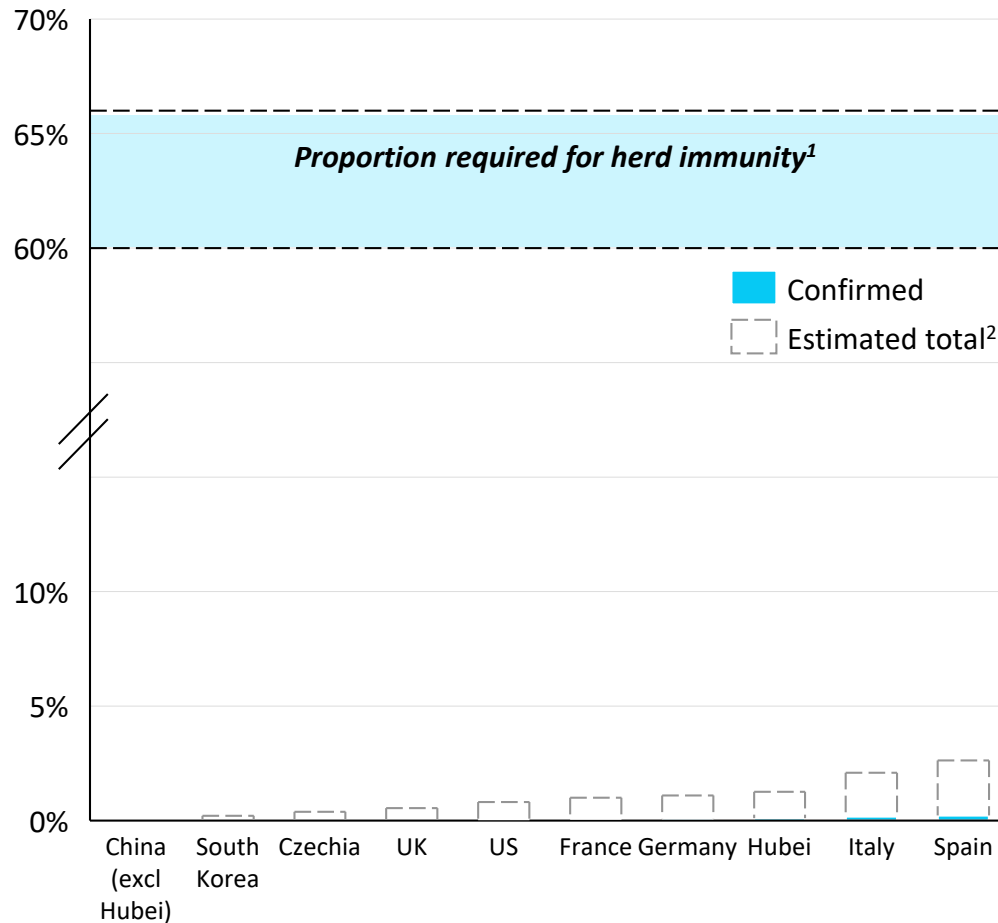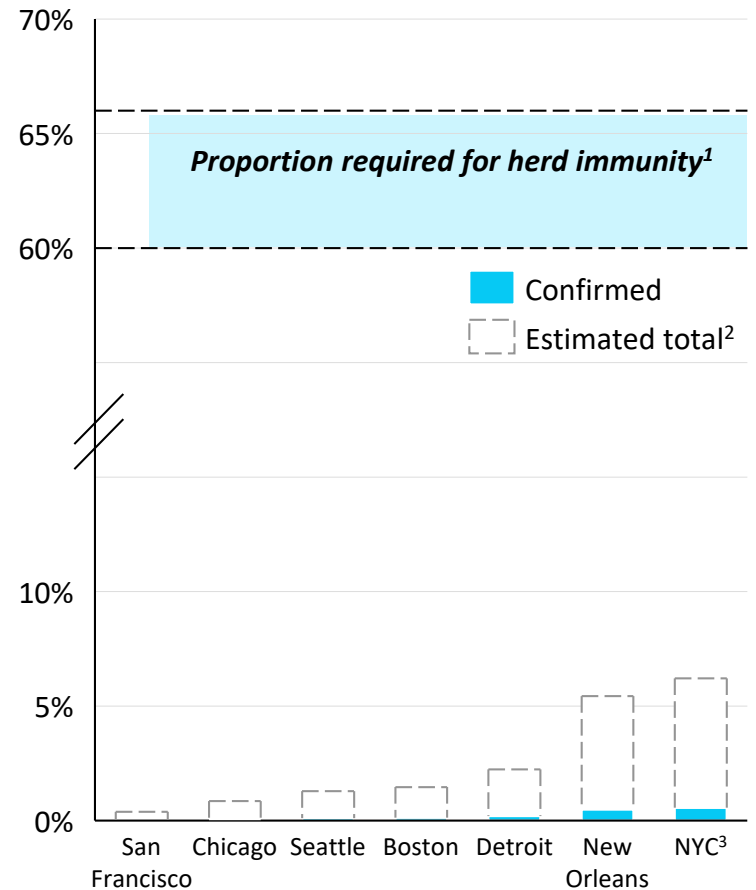| | Therapeutics[1] | Mutations[2] |
|---|---|---|
| **What we know** | • Three general classes of therapeutics which act differently could be tested / approved: **1) Antiviral** – slow virus spreading, **2) Symptom relief**, **3) Immune system enhancement** | • Virulence-lowering viral mutations have been observed previously (e.g., SARS) and have contributed to the decline of the epidemic |
| **Current Status** | • **No existing therapeutics are currently FDA approved** to treat COVD-19 specifically, though the FDA has authorized emergency use of anti-malarials for treatment of COVID-19 despite insufficient evaluation in carefully controlled studies<br><br>• Additional studies and trials are underway to test efficacy of existing drugs for COVID-19<br><br>• **Front-line physicians are using some therapies off-label**, which are approved for other indications<br><br>• Several **clinical trials are underway** with the CDC:<br> – **Remdesivir** (antiviral) – Gilead – originally for Ebola, but low efficacy -- highly limited supply<br> – **Hydroxychloroquine** (antiviral) – generic –used to treat Malaria -- limited supply | • There is **already early evidence of mutation** of COVID-19<br><br>• There is initial evidence from China of a **more aggressive (L) and a less aggressive strain (S)** of COVID-19<br><br>• **Very limited data is available on the impact** of identified mutations of the virus on prevalence, transmission, or severity of disease |
| **Key hurdles** | • Even if off-label efficacy was confirmed, **significant manufacturing and distribution capacity would be needed** to ramp up production of existing therapeutics; current global stores insufficient | • Timing is completely out of our control |

# WHAT ABOUT HERD IMMUNITY – CAN THAT HELP?

Herd immunity is a long way off, even in heavily affected epicenters like NYC

**Infected proportion of population, by country**



**Infected proportion of US population, by MSA**



*Proportion required for herd immunity[1]*

- Confirmed
- Estimated total[2]

Country chart x-axis: China (excl Hubei), South Korea, Czechia, UK, US, France, Germany, Hubei, Italy, Spain

MSA chart x-axis: San Francisco, Chicago, Seattle, Boston, Detroit, New Orleans, NYC[3]

Sources: Total confirmed cases by country as reported by Johns Hopkins University as of 3/29/2020; total confirmed cases by US county as reported by USA facts as of 4/2/2020; world population as reported by link; total population for MSAs as reported by Claritas.

1. Estimates for herd immunity for COVID based on R0 of 2-3 and a target of R0<1 (link) 2. Estimated total infected based on 5-10x ratio of true infected to confirmed (link and link) 3. NYC includes 5 boroughs only, not full MSA

© Oliver Wyman

# WHAT SHOULD COMPANIES BE THINKING ABOUT RIGHT NOW?

| | | |
|---|---|---|
| | **Confirm Business Resiliency** | All companies should continue to update and implement business continuity plans to reassure employees and ensure readiness for **supply chain constraints, demand shocks, and impacts to business partners**, prioritizing critical business activities and creating contingency plans for potentially longer durations of disruption |
| | **Model Financial scenarios** | As containment measures continue in many countries, companies should continue to **re-evaluate their financial outlook, modelling supply and demand** across a number of scenarios, identifying potential interventions and contingency plans for subsequent impacts and/or sustained challenges (e.g. strategies for managing variable costs, cash flow, liquidity) |
| | **Reassure Customers** | Consumer needs and concerns need to be understood, mapped, and incorporated into business continuity and restructuring plans such that consumer needs are addressed and trust is maintained |
| | **Move to Digitization Rapidly** | Some industries will see a **massive acceleration in the use of digital channels.** Retail, Financial Services, and Healthcare companies have experienced 100–900% growth in key digital channels in China during the outbreak. Customers with positive digital experiences are unlikely to return to analog channels |
| | **Prepare for Long Haul** | Evaluate strategies to sustain through 9–12 months (or more) of disruption if subsequent demand shocks exist. Companies should consider the nature and required timing associated with more structural changes to their operations |
| | **Convene Industry** | Companies should consider which industry and government collaborations are necessary to address safety concerns, share best practices, stimulate demand, and rebuild consumer trust |

# 03
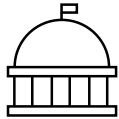
## PERSPECTIVES ON POTENTIAL ECONOMIC IMPACTS

# US CONGRESS PASSED THE LARGEST EVER PEACETIME STIMULUS PACKAGE – THE $2.2 TRILLION CARES ACT

Key elements of the Coronavirus Aid, Relief, and Economic Security (CARES) Act
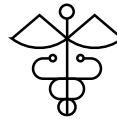
## Government Entities

> $150 BN

Includes:
- $45 BN in disaster relief for state and local governments
- $30 BN in emergency education funding
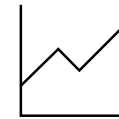- $35 BN in emergency transit funding

## Hospitals

$130 BN

Includes:
- $65 BN directly to hospitals
- $35 BN to doctors, nurses, and supplies
- The remainder towards Medicare reimbursements and medical research
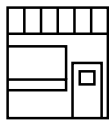
## Distressed Businesses

$500 BN

Includes:
- $29 BN for direct financial aid to struggling airlines and air cargo carriers
- $454 BN for loans and other investments by the Fed and Treasury to provide liquidity to the financial system
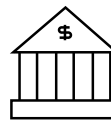
**For Fed programs**

## Small Businesses

$377 BN

Includes:
- $349 BN in small business loans through the Payment Protection Program (PPP)
- $10 BN for Small Business Administration (SBA) emergency grants
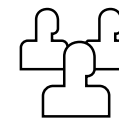
## Financial Institutions

Includes:
- Delay to implementation of FASB's Current Expected Credit Losses (CECL)
- Loan modifications related to COVID-19 do not have to be categorized as Troubled Debt Restructurings (TDRs)

## Individuals

> $450 BN

Includes:
- Direct payments of $1,200 to most Americans[1]
- $250 BN in unemployment benefits
- Payment deferrals for federally backed mortgages and student loans

1. Individuals who earn $75,000 in adjusted gross income or less would get direct payments of $1,200 each, with married couples earning up to $150,000 receiving $2,400 and an additional $500 per each child. The payment would scale down by income, phasing out entirely at $99,000 for singles and $198,000 for couples without children

# THE FEDERAL RESERVE ACTIONS EXCEED FINANCIAL CRISIS

## Policy actions

- **Lowered interest rates** by 1.5% to 0 – 0.25% in two steps within less than two weeks
- **Direct purchases of government and GSE securities at scale**
- **Dollar swap facility** with other central banks
- **Re-establish financial crisis era liquidity and credit support facilities,** e.g.
  - CPFF for commercial paper
  - MMLF for money market funds
  - TALF for asset back securitization
- And some **new facilities for credit support**
  - P(S)MCCF for primary issuance and secondary market corporate bonds
  - Main Street Business Lending Program for small businesses
- **Tolerance for borrower forbearance** by banks

## Observations

- **Quickly deployed monetary policy firepower**
- Signal that **Fed plans to flexibly use its balance sheet** (already at $5.2TN) for market functioning and support
- **Support for global demand for dollars**
- **Took facilities developed during financial crisis off the shelf** – and expanded from there
- **Introduction of new facilities point to much wider support for credit** in the economy
- **$454BN capital from CARES Act expected to be levered up to support $3-4TN in credit** (lending)
- **Banks are much stronger** coming into this crisis making them part of solution (not problem)

# LATEST GDP FORECASTS INDICATE A SEVERE SHOCK IN THE U.S. ECONOMY

The escalation of the Covid-19 crisis has lead to significant downward revisions in GDP forecasts globally

## U.S. Real GDP Growth Forecasts – Q1, Q2, and annual
*Annualized growth rate, by select economic analysts (14)[1,2]*
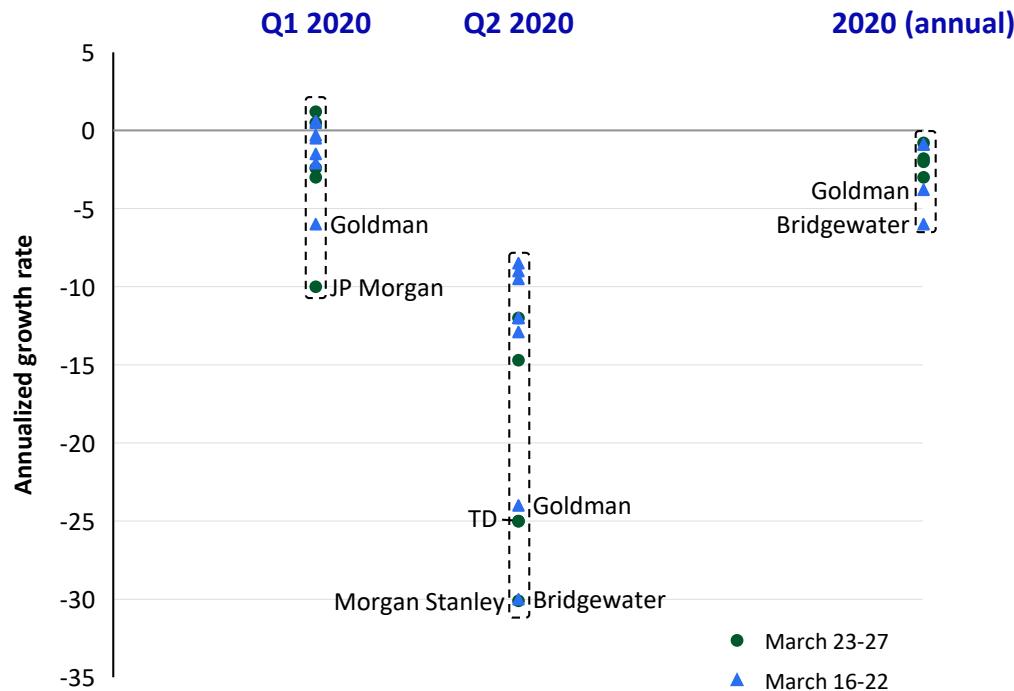


| | Q2 2020 | Q3 2020 | 2020 (annual) |
|---|---|---|---|
| **Median** | -1.0% | -12.9% | -1.9% |
| **Average** | -1.9% | -17.3% | -2.4% |
| **Max / Min** | 1.2% /-10% | -8.5% / -30.1% | -0.8% / -6% |

## Key observations from estimates

- Forecasts have been continuously evolving during the last month – consensus is that bad news on the virus continues to outweigh good news on policy actions

- Forecasted Q2 qoq annualized growth rate in the US (~10-30% drop) could be the worst since we have quarterly data available

- As the pandemic has spread in the US, the economic impact becomes more demand- than supply-driven

- Key indicators over the next few weeks will provide some needed clarity, including trend for percent of U.S. population infected (scenarios ranging up to 80%)[3] and time to stabilization in infections

1. Sources: Deutsche Bank, Bank of America, Wells Fargo, Moody's, UBS, Natwest, Goldman Sachs, Bridgewater, Morgan Stanley. TD Securities, UBS, Credit Suisse, Blomberg, Citi.
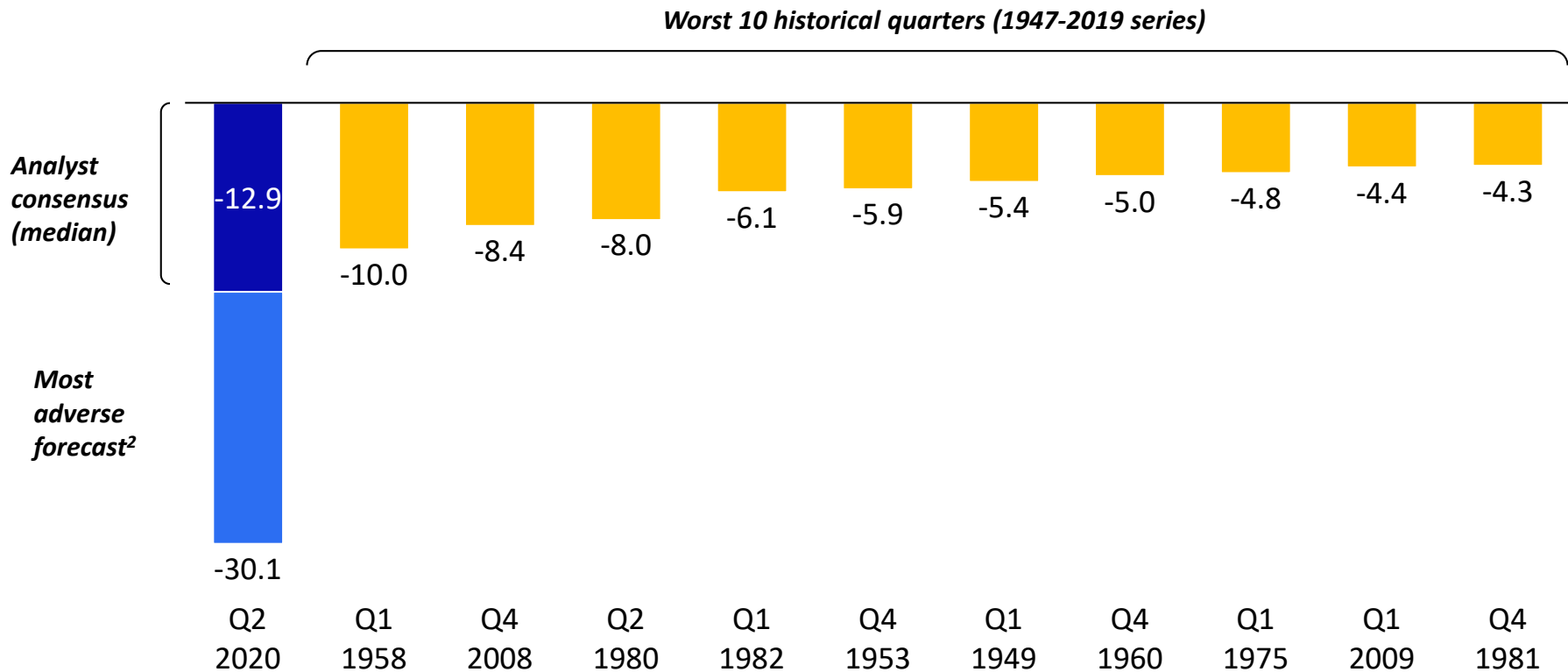2. Quarterly estimates in terms of qoq% seasonally adjusted annual rate (saar)
3. Imperial College COVID-19 response team

# Q2 2020 COULD BECOME THE WORST QUARTER IN RECORDED HISTORY

Analysts expect a ~10-30% decline in annualized U.S. GDP in Q2; never observed before in the U.S.

**Most severe quarterly declines in real GDP compared to Q2 2020**
*% Qoq saar (US)[1]*



*Worst 10 historical quarters (1947-2019 series)*

**Analyst consensus (median)**

**Most adverse forecast[2]**

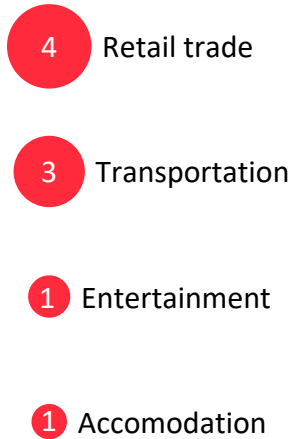| Q2 2020 | Q1 1958 | Q4 2008 | Q2 1980 | Q1 1982 | Q4 1953 | Q1 1949 | Q4 1960 | Q1 1975 | Q1 2009 | Q4 1981 |
|---|---|---|---|---|---|---|---|---|---|---|
| -12.9 | -10.0 | -8.4 | -8.0 | -6.1 | -5.9 | -5.4 | -5.0 | -4.8 | -4.4 | -4.3 |
| -30.1 | | | | | | | | | | |

1. Saar: Seasonally adjusted annual rate
2. From Bridgewater (Mar19), Morgan Stanley (Mar-25)
Sources: BEA, (historical data), Oliver Wyman analysis

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# IMPACTS ARE UNEVEN ACROSS INDUSTRIES

Highest impacts on industry-level GDP are generally expected in industries that require (or are strongly linked) to in-person consumption
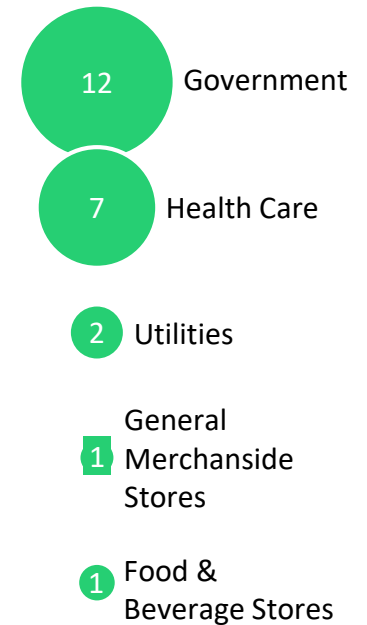
## Large Negative Shock
*Up to -90%*

- **4** Retail trade
- **3** Transportation
- **1** Entertainment
- **1** Accomodation

## Moderate Negative Shock
*Up to -50%*

- **11** Manufacturing
- **6** Wholesale Trade
- **4** Construction
- **2** Food/Drinking places
- **2** Mining

## Modest Negative Shock
*Up to -20%*

- **21** Finance, Insurance, RE, Rental
- **13** Professional services
- **5** Information
- **2** Other services
- **1** Agriculture
- **1** Education

## Positive shock
*Up to +20%*

- **12** Government
- **7** Health Care
- **2** Utilities
- **1** General Merchanside Stores
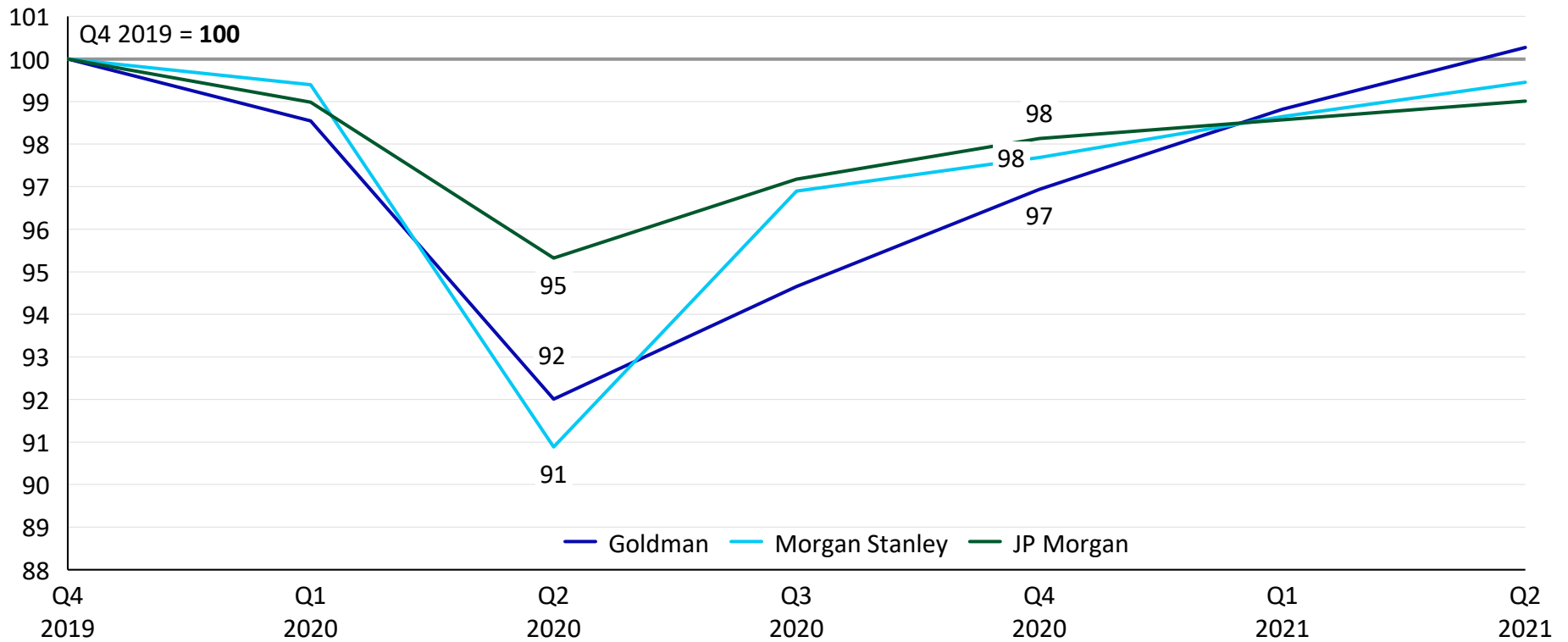- **1** Food & Beverage Stores

***Bubble size represents contribution to U.S. GDP***

Sources: BofA Global Research, Goldman Sachs Economics Research, Oliver Wyman analysis

# PROJECTIONS FOR THE U.S. ASSUME A RETURN TO PRE-COVID LEVELS BY MID-2021

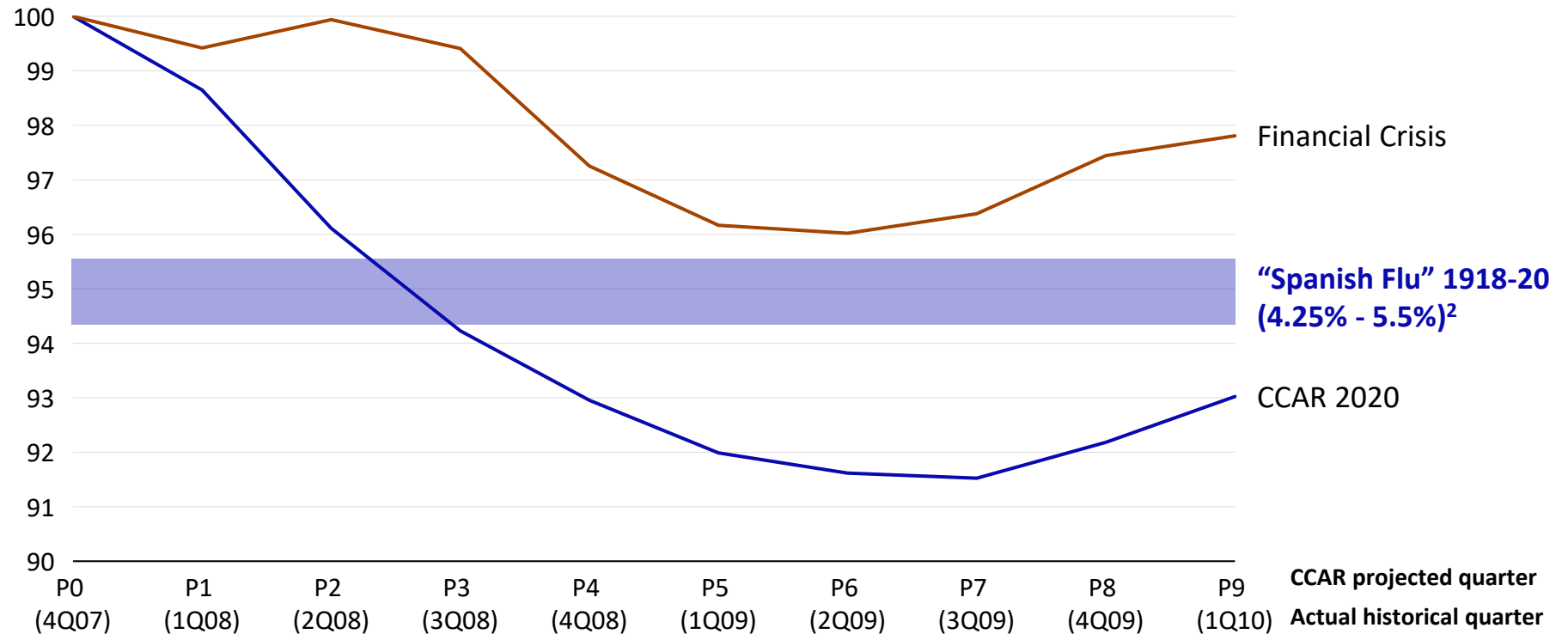**U.S. Real GDP relative to Q4 2019 (100)**

# FED'S 2020 BANK STRESS TEST GDP DECLINE COMPARED TO FINANCIAL CRISIS AND 1918-20 GLOBAL PANDEMIC ESTIMATE

**US GDP Indexed to P0 (CCAR 2020[1]) and 4Q07 (Financial Crisis)**



Financial Crisis

"Spanish Flu" 1918-20
(4.25% - 5.5%)[2]

CCAR 2020

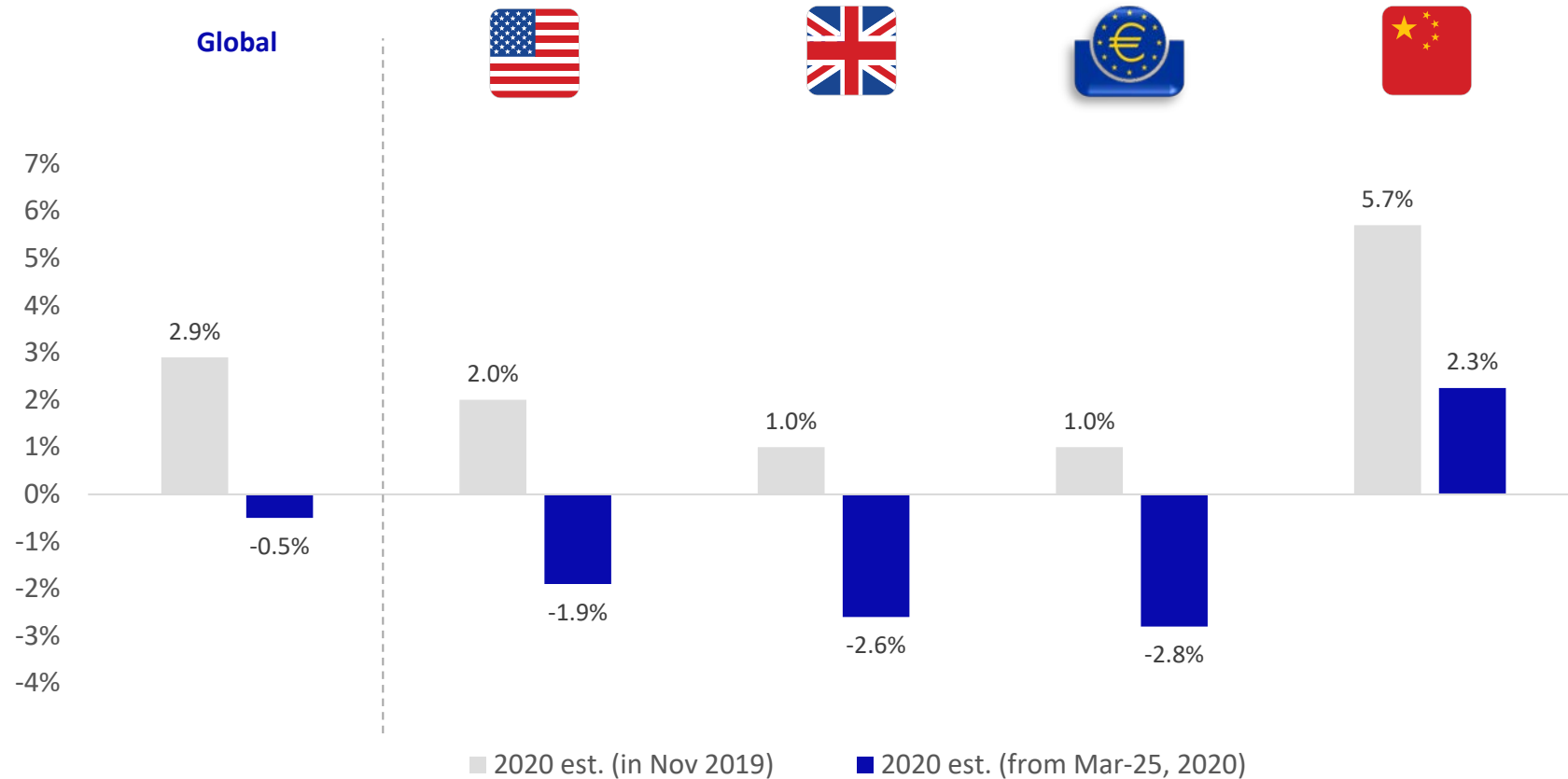| | |
|---|---|
| P0 (4Q07) P1 (1Q08) P2 (2Q08) P3 (3Q08) P4 (4Q08) P5 (1Q09) P6 (2Q09) P7 (3Q09) P8 (4Q09) P9 (1Q10) | **CCAR projected quarter** |
| | **Actual historical quarter** |

1. Source: "CCAR 2020 data release" - Federal Reserve. CCAR = Comprehensive Capital Analysis and Review
2. Source "Economic Impact of an Influenza Pandemic on the United States" – Federal Reserve Bank of St Louis

# LATEST GDP ESTIMATES IN SELECT REGIONS

The escalation of COVID-19 crisis has lead to significant downward revisions in GDP forecasts globally

**Consensus 2020 Real GDP Growth Forecasts, Nov-2019[1] vs Mar 2020[2]**

*% growth YoY, median*



Global

| Region | 2020 est. (in Nov 2019) | 2020 est. (from Mar-25, 2020) |
|---|---|---|
| Global | 2.9% | -0.5% |
| US | 2.0% | -1.9% |
| UK | 1.0% | -2.6% |
| Euro | 1.0% | -2.8% |
| China | 5.7% | 2.3% |

■ 2020 est. (in Nov 2019)   ■ 2020 est. (from Mar-25, 2020)

# READ OUR LATEST INSIGHTS ABOUT COVID-19 AND ITS GLOBAL IMPACT ONLINE

Oliver Wyman and our parent company Marsh & McLennan (MMC) have been monitoring the latest events and are putting forth our perspectives to support our clients and the industries they serve around the world. Our dedicated COVID-19 digital destination will be updated daily as the situation evolves.



[Visit our dedicated COVID-19 website](#)
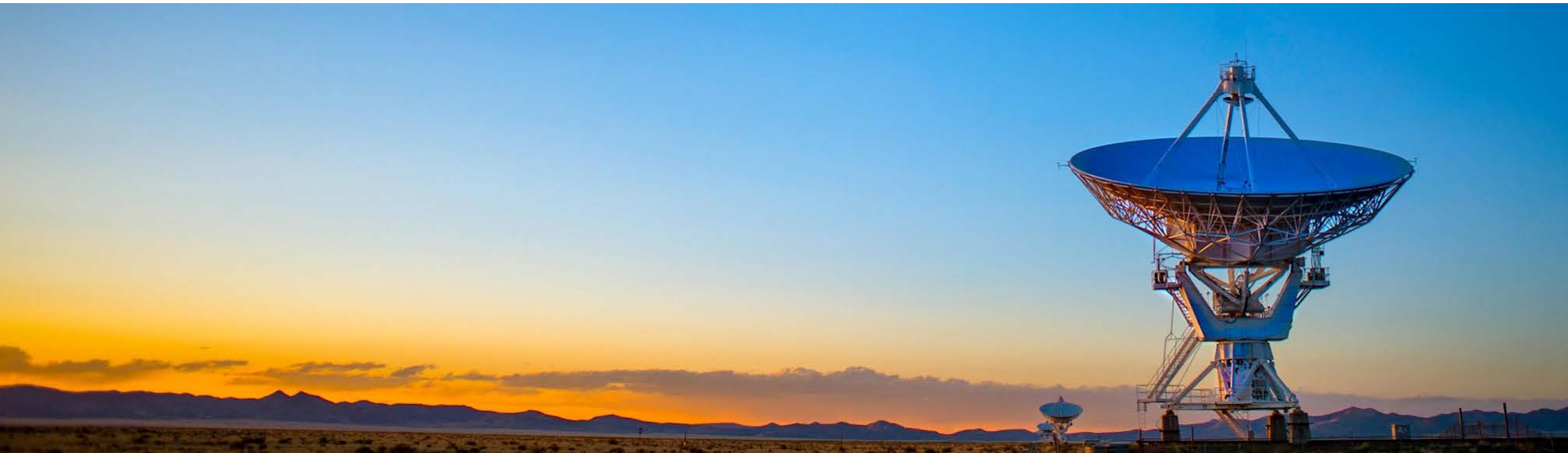
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