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RESPONDING TO COVID-19

Primer, Scenarios, and Implications

Joint EUI-Oliver WymanForum online debate
"SME Financing in the COVID-19 Context"

April 29, 2020

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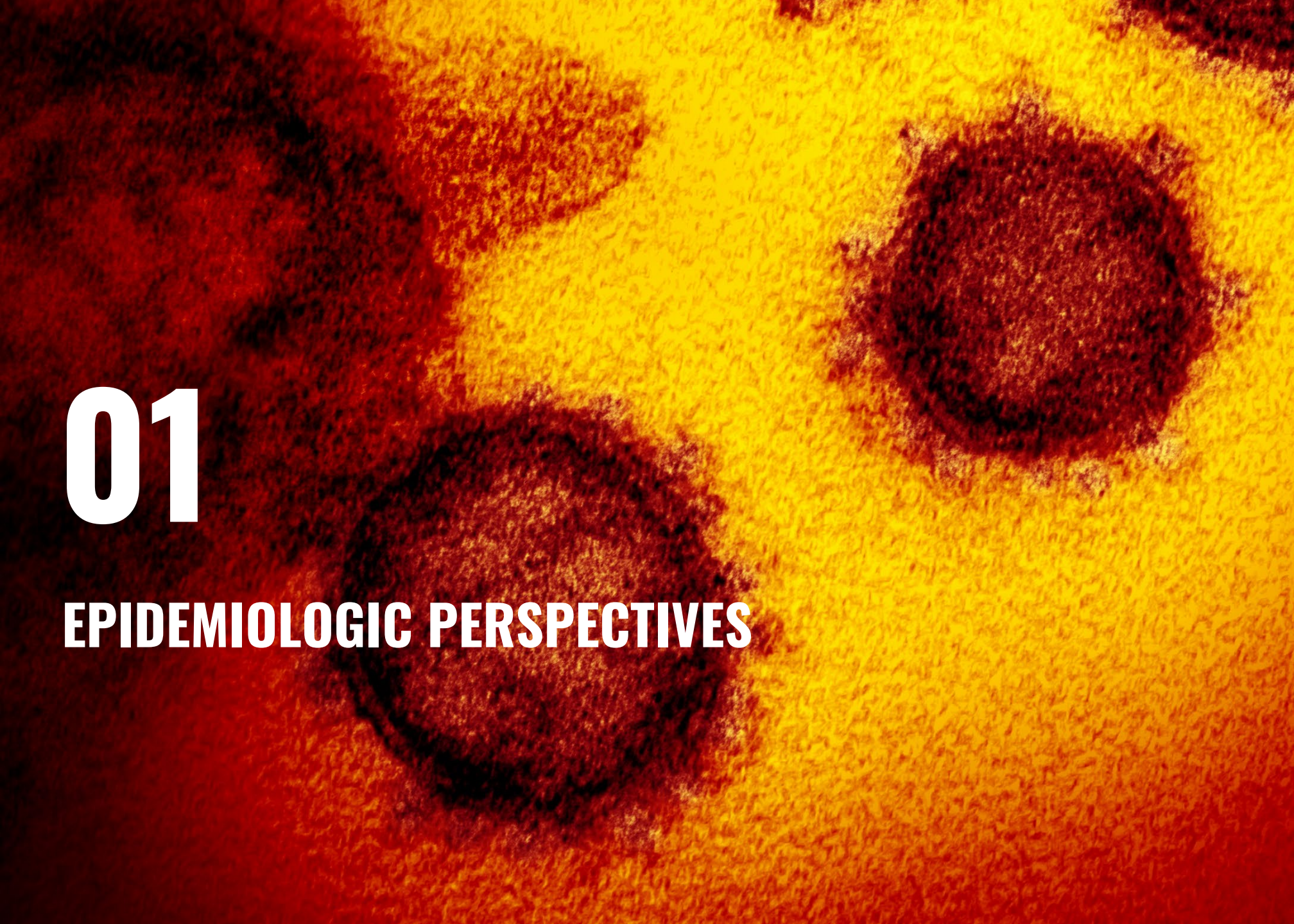


01

EPIDEMIOLOGIC PERSPECTIVES

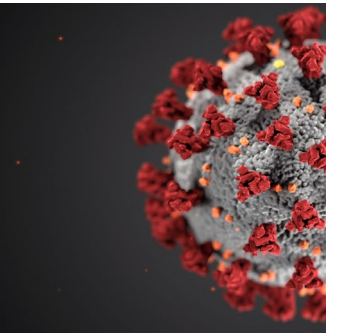
INTRODUCTION: COVID-19 PRIMER

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

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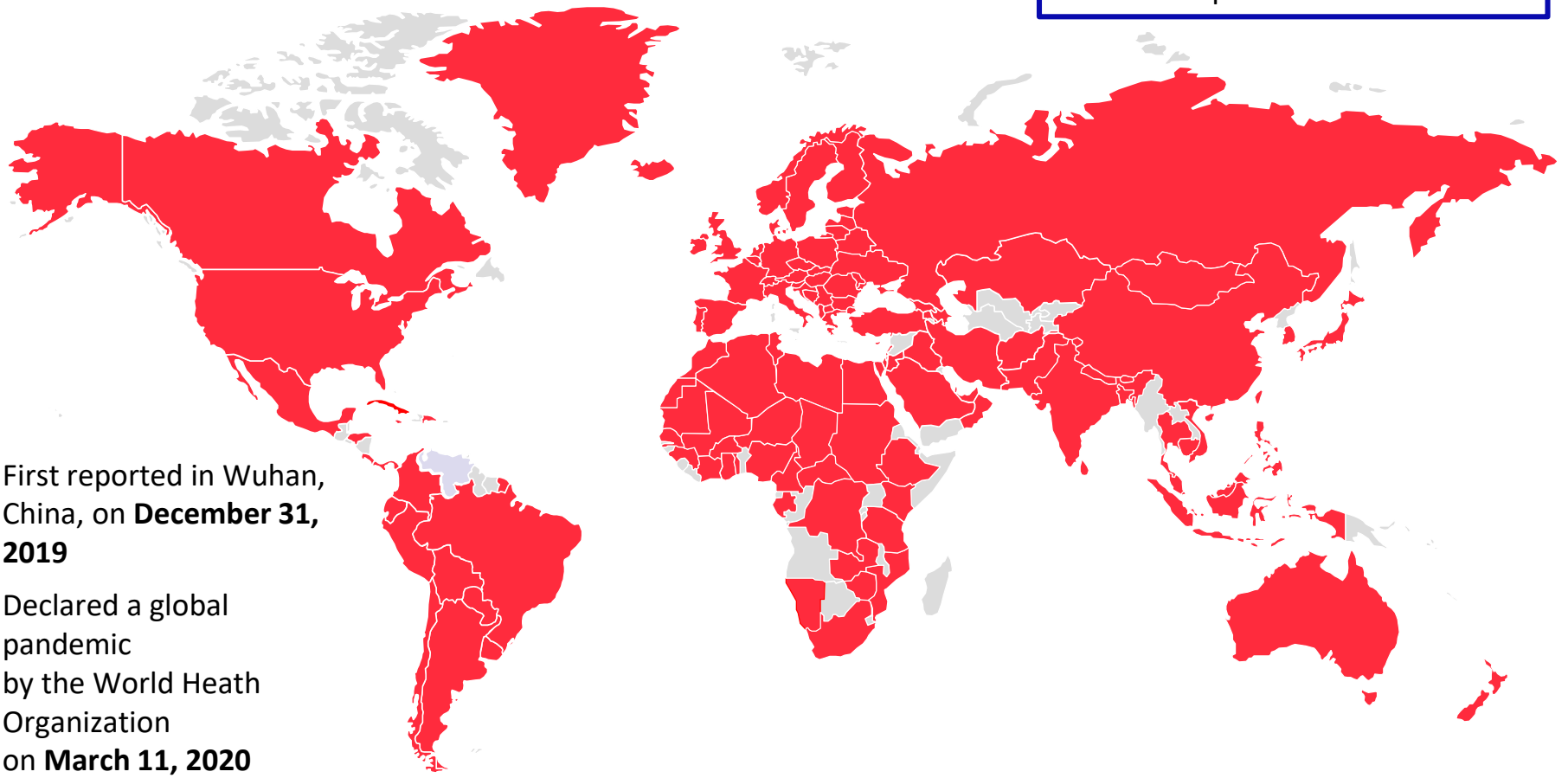
Information as of 4/22/20

COVID-19 SPREAD GLOBALLY

As of April 22nd, 2020

- ~2.6M cases reported in 185 countries and territories
- ~183 K 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)

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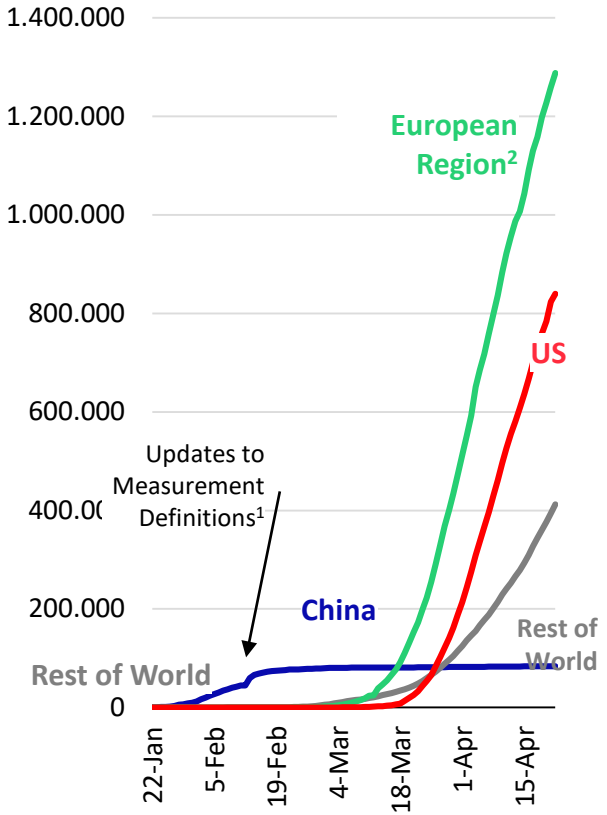
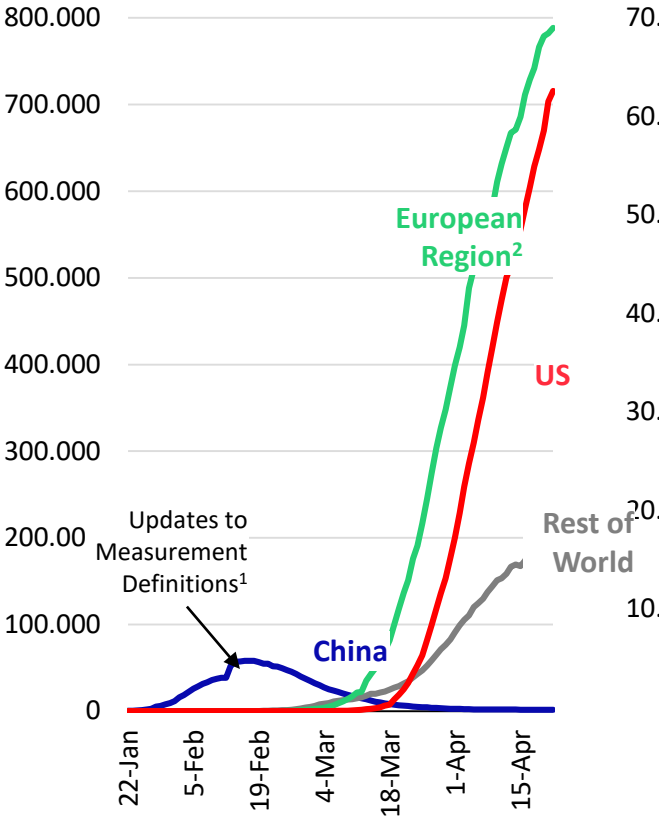
COVID-19 TRENDS AND SPREAD OF THE DISEASE

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

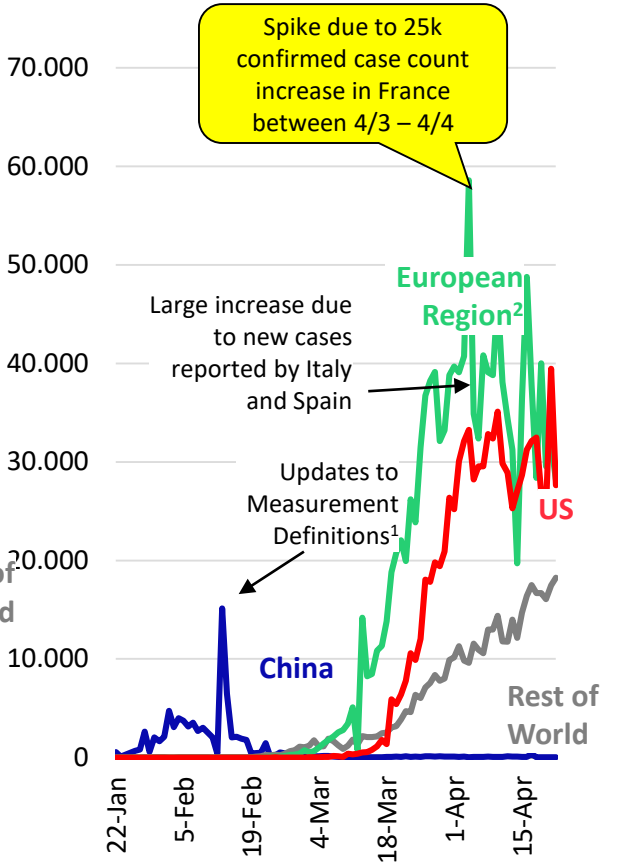
Cumulative Confirmed Cases of COVID-19



Active cases per day of COVID-19



New Cases Per Day of COVID-19



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

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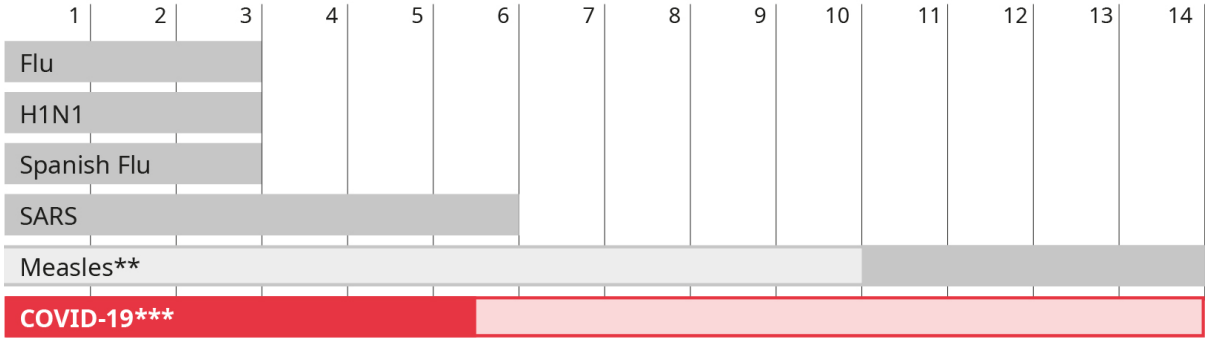
HOW DOES COVID-19 COMPARE TO OTHER DISEASE OUTBREAKS? (2 OF 2)

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

Incubation Timeline (Days)*, [1]



*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]
- Ideally, asymptomatic individuals should be tested during quarantine to ensure they have not been infected

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]
- Initial reports suggest a latency period of 3 days (with substantial variability) prior to an individual becoming infectious[7]
- Viral loads build rapidly and continue to shed until 6-12 days after symptoms have cleared[6]
- New reports of patients testing positive after recovery raise more questions on potential length of infectious cycle[8]

1. CDC 2. Annals of Internal Medicine (link) 3. JAMA (link) 4. NEJM (link) 5. Science (link) 6. medRxiv (link) 7. SARS-CoV2 by the numbers (link) 8. DownTo Earth (link)

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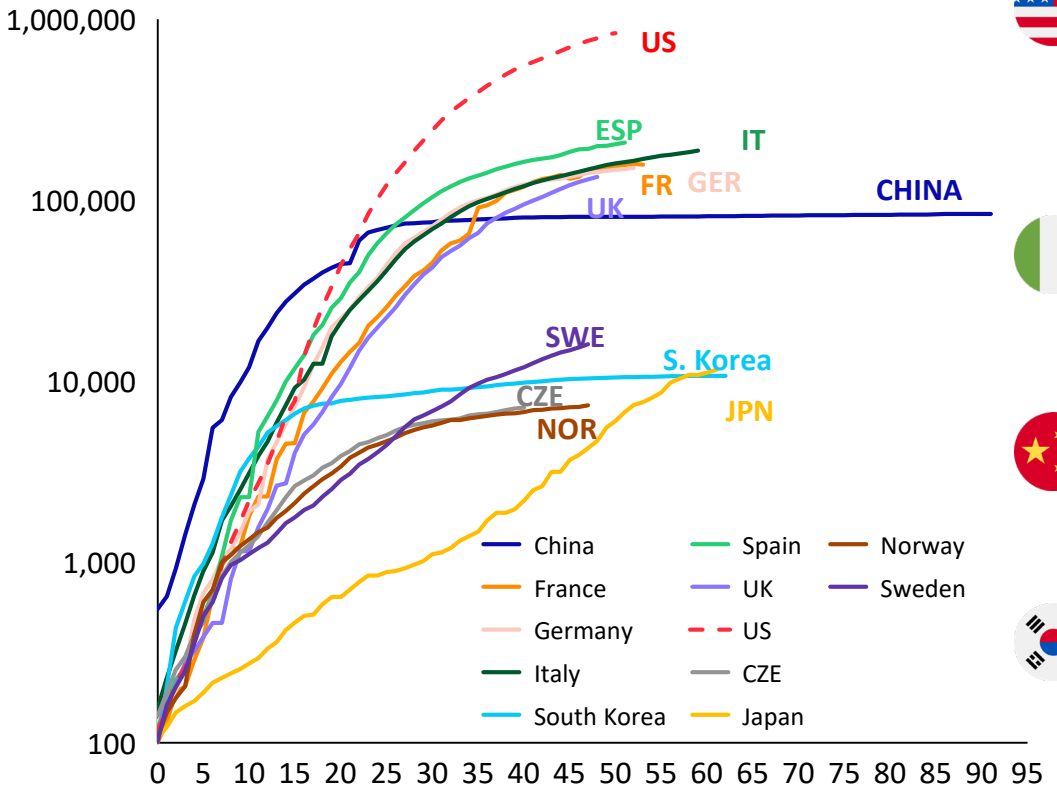
MOST COUNTRIES – INCLUDING THE US – CONTINUE TO SEE EXPONENTIAL GROWTH; CHINA AND SOUTH KOREA HAVE FLATTENED THE CURVE

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, the majority of which have implemented stay-at-home orders
- Some regions with early first peaks are beginning to plan for relaxation, though no hard dates are set

- Extensive shutdown, first in Lombardy then nationwide imposed after outbreak had become unmanageable
- Relaxation of some restrictions has begun, as new cases reach a first peak and testing capacity expands

- Enforced city-wide quarantine of Wuhan post-outbreak
- Mobile monitoring / enforcement (via WeChat, etc.)
- Wuhan lockdown ended this week, though schools and many business remain closed

- 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

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 4/22/2020.

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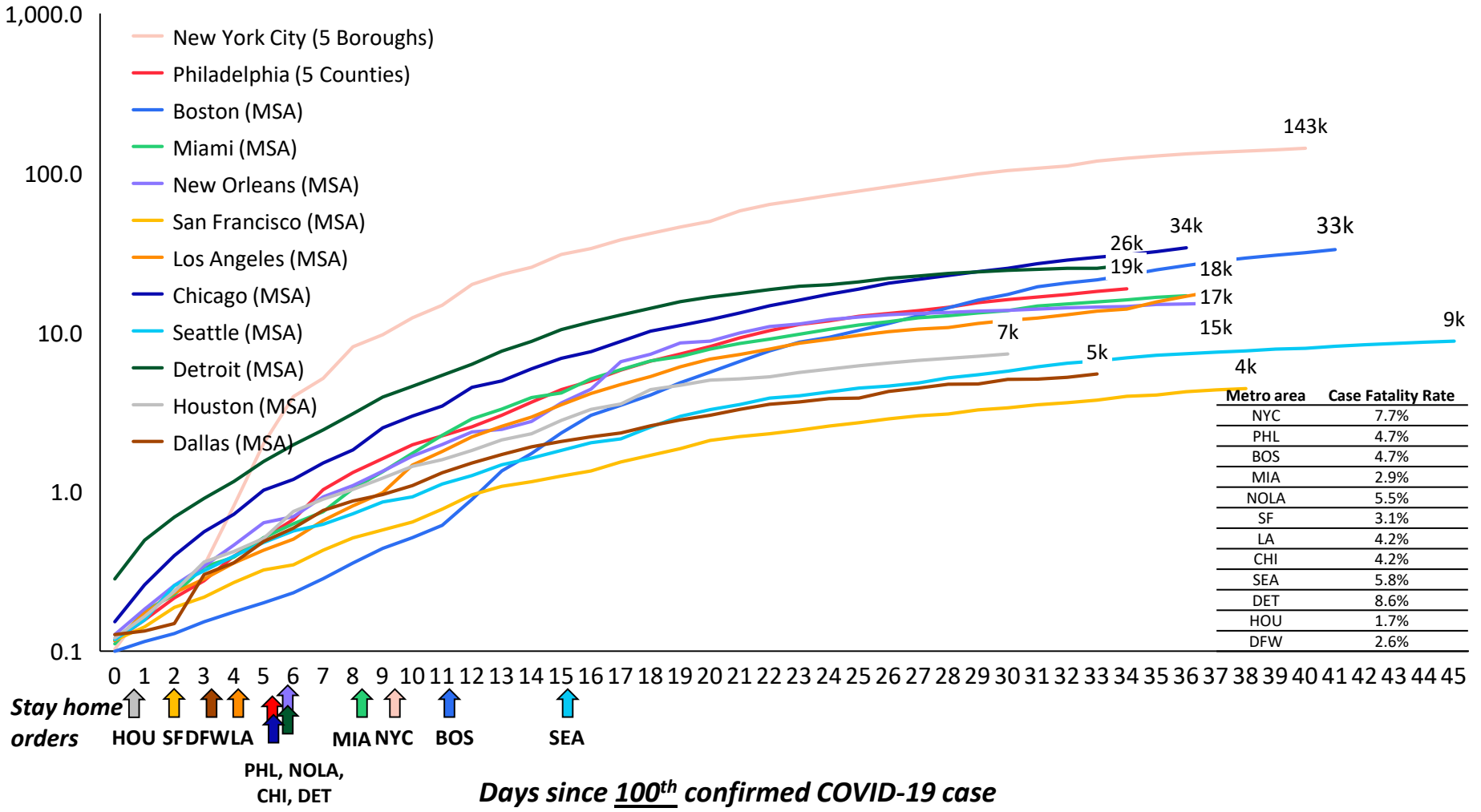
THE CASE COUNT OF COVID-19 CONTINUES TO GROW ACROSS THE UNITED STATES

Confirmed Cases by US Metro area

Log scale



Metro area	Case Fatality Rate
NYC	7.7%
PHL	4.7%
BOS	4.7%
MIA	2.9%
NOLA	5.5%
SF	3.1%
LA	4.2%
CHI	4.2%
SEA	5.8%
DET	8.6%
HOU	1.7%
DFW	2.6%

Data: USA Facts County Level Data as of 4/22/2020. Stay at home orders data from New York Times.

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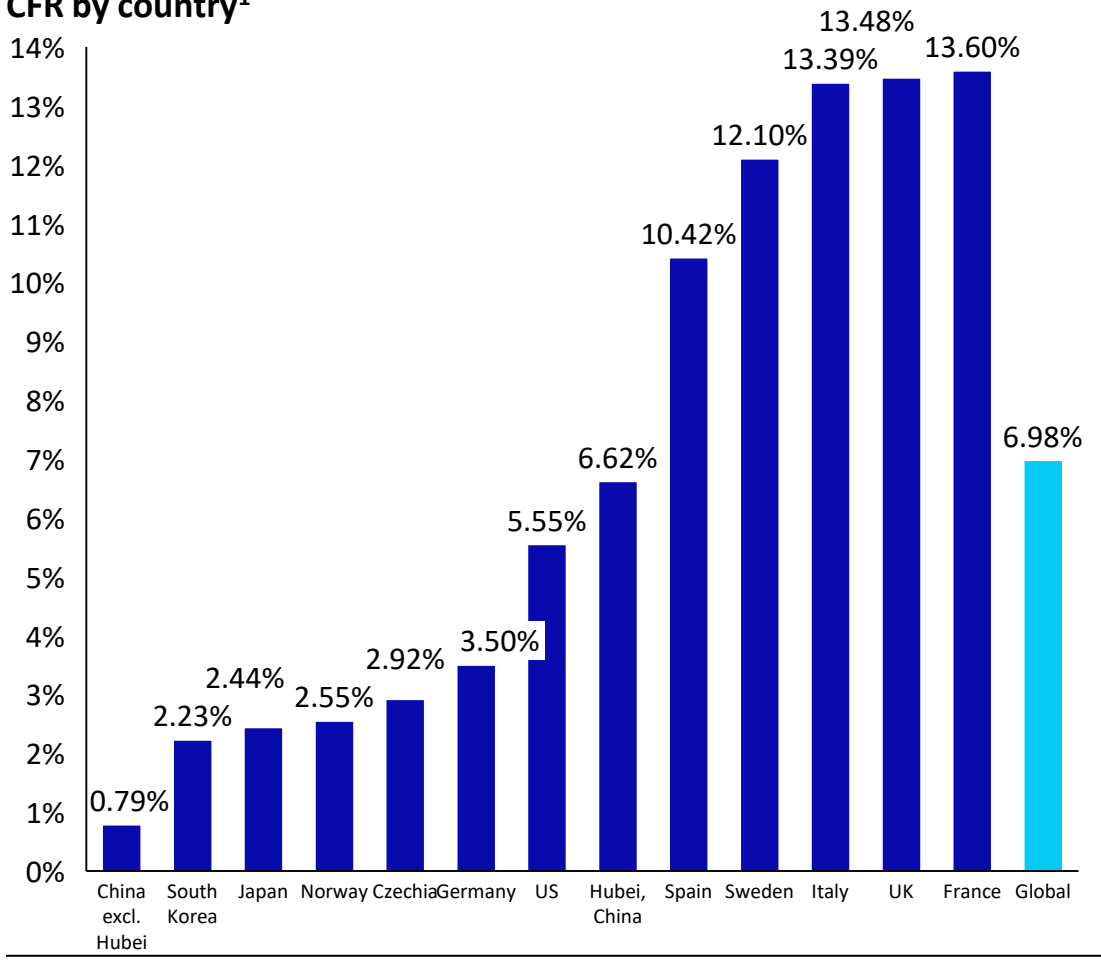
CASE FATALITY RATE (CFR) BY COUNTRY

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]



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

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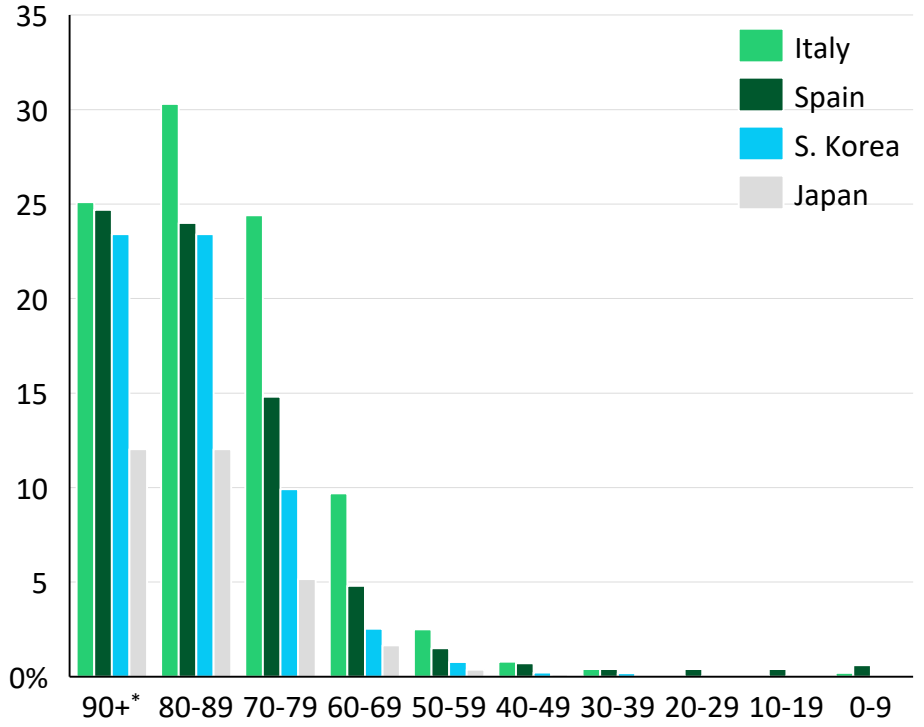
CASE FATALITY RATE (CFR) BY AGE

For all geographies fatality rates increase significantly with age

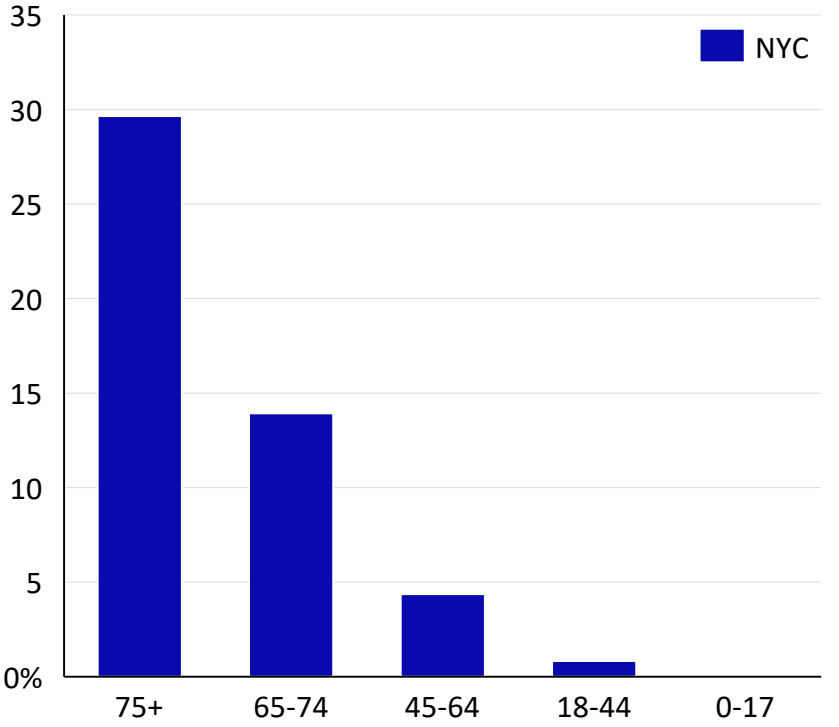
Case Fatality Rate by Age

As % of confirmed cases[1,2,3,4]



Case Fatality Rate by Age

As % of confirmed cases[5]



1. Italy data as of 04/20/2020 (link) 2. S. Korea data as of 04/21/2020 (link) 3. Spain data as of 04/21/2020 (link) 4. Japan data as of 04/19/2020 (link) 5. NYC data as of 04/19/2020 (link)
Notes: * South Korea does not provide data for ages 80+, same percentage has been listed for 80-89 and 90+ **Japan and Italy data includes a small proportion of cases without a specified age, these were not included

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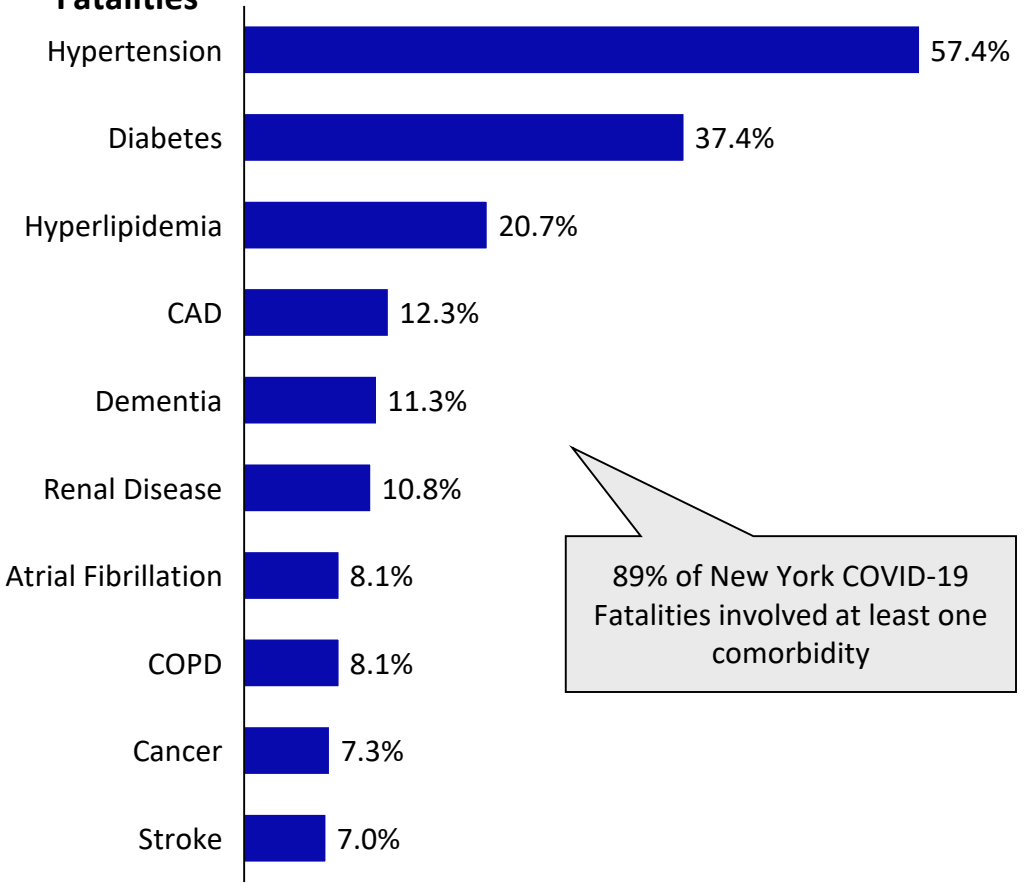
CASE FATALITY RATE (CFR) BY CO-MORBIDITY

Significantly higher death rates occur among those with underlying conditions

Prevalence of comorbid condition in NY COVID-19 Fatalities[1]



Comorbidity reports across the globe

- Initial data from China reported significantly elevated CFRs for patients with **cardiovascular disease, diabetes, chronic respiratory disease, hypertension and cancer**[2]
- Most common comorbidities identified in Italian COVID-19 fatalities were **hypertension, diabetes, ischemic heart disease, renal failure, atrial fibrillation, COPD and cancer**[3]
- A study in Spain identified **cardiovascular disease and respiratory problems** as the most common comorbidities in severely ill and fatal cases[4]
- Emerging data from the US and France suggest that **obesity** is an additional risk factor for severe disease resulting from COVID-19[5]

1. New York State Department of Health as of 04/20/2020 (link) 2. JAMA (link) . 3. JAMA. (link) 4. El Pais (link) 5. Medscape (link)

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EARLY DATA SUGGEST RACE AND GENDER-BASED DISPARITIES

These may arise largely from existing differences in underlying conditions

In the US: African Americans are harder hit

- CDC report covering 3/1-3/30 for 14 states: 33% of COVID-19 hospitalizations are of African Americans, though only 18% of total population in relevant states is African American[1]
- Dovetails with earlier piecemeal reports:

For cases in which race is available, % African American:

Region	% of Cases	% of Deaths	% Total Pop
Milwaukee[2]	50%	81%	26%
Michigan[2]	35%	40%	14%
Chicago[3]	Unavailable	70%	29%
North Carolina[4]	38%	39%	22%

- **Likely causes**
  - Higher proportion of pre existing conditions (*e.g.* 40% of African Americans have hypertension vs. 29% of total pop[5])
  - Lower income and likely to have hourly jobs that do not allow work from home[6]
  - Racial bias in treatment: review of lab billing information suggested African Americans with coronavirus symptoms were less likely to be tested[7]

Globally: Men are at higher risk

- Illness rates are higher among men than women globally, though the extent depends on the dataset[8]
  - Chinese CDC reported that 53% of cases are male
  - WHO found 51%
  - Wuhan-specific study found 58%
  - Recent US CDC report noted higher COVID-19 hospitalization rates for males (5.1 vs. 4.1 per 100K population)[1]
- An even clearer difference is observed in death rate[8]
  - China saw a 1.7% fatality rate for women vs. 2.8% for men
  - In Spain, men make up 65% of deaths
  - In Italy 8% of male patients died vs. 5% of women
- **Likely causes**
  - Women often have stronger immune systems potentially mediated by estrogen activity
  - Men may exhibit more behaviors associated with contracting COVID-19 (more travel, more outside-of-home work)
  - Men are more likely to have underlying conditions that increase risk of COVID-19 hospitalization and death

1. States include CA, CO, CT, GA, IA, MD< MI, MN, NM, NY, OH, OR, TN, UT; 2. As of 4/3, ProPublica (link); 3. As of 4/5, NPR (link); 4. As of 4/9, NCDHHS (link); 5. CDC brief (link); 6. StatNews (link); 7. Kaiser Health News (link); 8. StatNews (link)

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AT A GLANCE: SUMMARY FACTS

	Key facts	Implications
Contagion	• Initial estimates suggested COVID-19 **R0 is 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] • New **emerging estimates suggest R0 may be closer to 5.7** (edge of range 3.8-8.9)[14]	COVID-19 is at least 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 spread**
Incubation period	• **The incubation period is a median of 5.5 days (up to 14 days)**[1, 10,] (vs 3-day period for common flu[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 suppress spread
Fatality	• **Case fatality rates are trending at 7.0% globally**[8] (vs. 0.1% for flu)[9] • Estimates for **infected fatality rate are 0.3%-1.3%** based on assumptions around the number of undiagnosed individuals[13]	Fatality is orders of magnitude higher than typical influenzas
Portion of cases asymptomatic but contagious	• COVID-19 can be **spread asymptomatically**[5] • In retrospective studies 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] • Early indicators from point in time comprehensive testing of small populations (e.g., Vo, Italy; Iceland) **suggest as many as 50% of cases could be asymptomatic**[12] • In cohorts of younger individuals (e.g., pregnant woman, sailors on USS Theodore) the proportion of asymptomatics exceeded 60%[15, 16]	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;** 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. MedRxIv. "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 (link), Eurosurveillance Paper (link) 12. ZMEScience report (link) 13. SARS-CoV2 by the numbers (link) 14. Emerging Infectious Diseases (link) 15. Business Insider (link) 16. NEJM (link)

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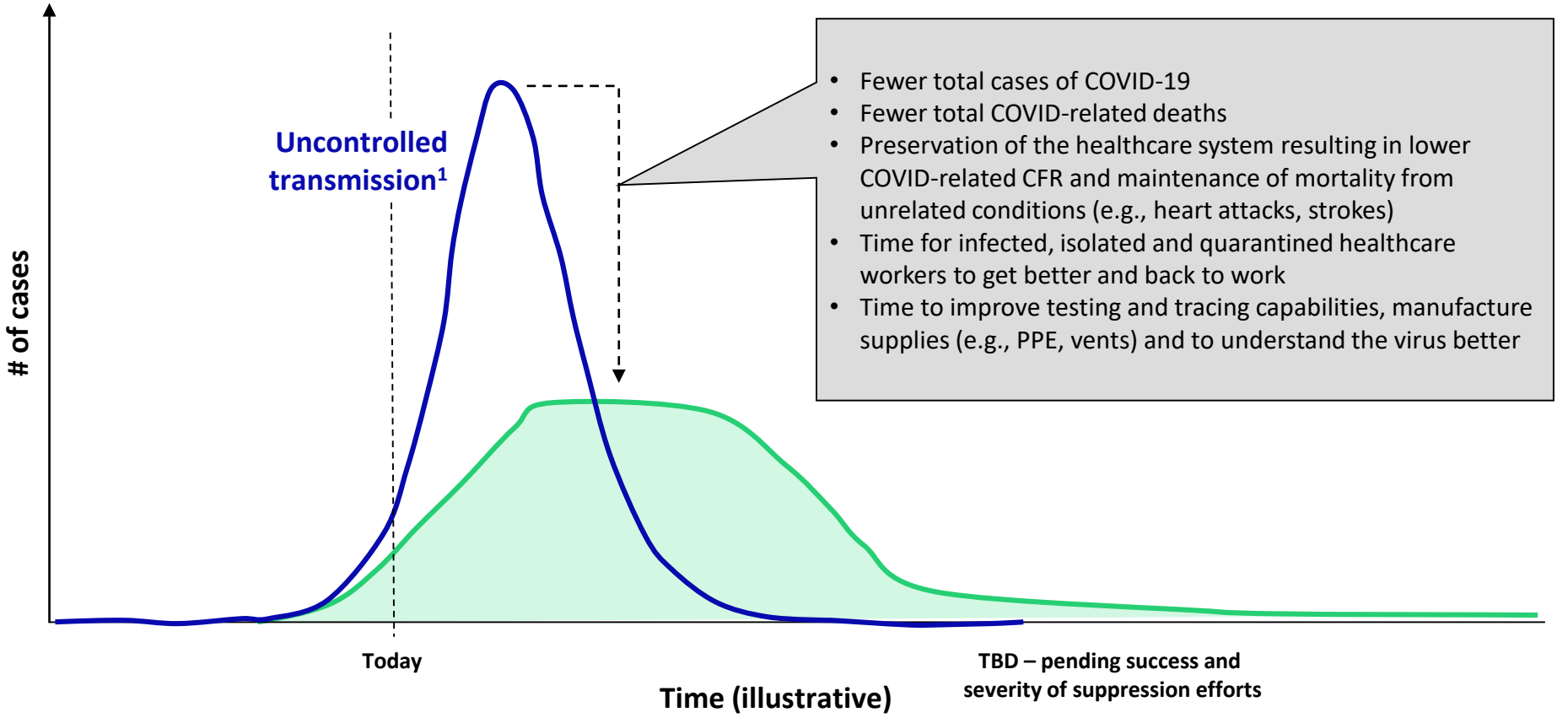
HOW CAN SUPPRESSION MEASURES LOWER THE BURDEN OF THE PANDEMIC?

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 first peaks may vary between countries



1. Assuming case-based isolation only

Source: Adapted from "How will country-based mitigation measures influence the course of the COVID-19 epidemic". Lancet. Mar 6 2020. https://doi.org/10.1016/S0140-6736(20)30567-5. Concepts sourced from Tomas Puyeo.

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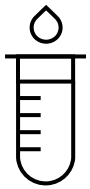
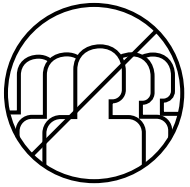
WHAT LEVERS CAN HELP SUPPRESS THE PANDEMIC?

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 • 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]) • **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 • Demonstrated to work successfully in Wuhan	• **Decisive, early action:** 'Wait and see' or fragmented approaches only worsen outcomes • **Comprehensive plan:** Closing bars, schools, restaurants, gyms, churches to maintain social distancing, restricting non-essential travel and quarantining all infected patients including asymptomatic ones • **Compliance (enforced if necessary):** Experience in the US and Europe demonstrates that lack of compliance worsens outcomes

Sources: 1. Adapted from "How will country-based mitigation measures influence the course of the COVID-19 epidemic". 2. Lancet. Mar 6 2020 (link) 3. Concepts sourced from Tomas Puyeo. 4. Center for Strategies and international Studies (link)

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02

SUPPRESSION SCENARIOS

EPIDEMIOLOGY AND SUPPRESSION MEASURES SUMMARY

- **The epidemiology of the novel coronavirus impacts containment efforts**
  - R0 estimates range between 2 and 5.7, meaning each infected individual infects at least 2, and up to 5-6 others
  - Median 5.5 day incubation period (from exposure to symptom onset) is longer than that of a disease like the flu, which means a longer window when unsuspecting individuals can infect others
  - Studies suggest that anywhere between 18 and 30% of infected individuals remain asymptomatic for the duration of the disease, further complicating containment efforts
  - Individuals have been shown to test positive and demonstrate viral shedding for 6-12 days (or more) post resolution of symptoms, creating a large window during which an individual is contagious
- Several capabilities can enable countries to relax suppression and avoid a severely damaging second wave
  - Healthcare system capacity recovered to the extent that normal care can be provided without overburdening facilities or personnel
  - The capacity to do extensive testing, both for presence of the virus as well as for antibodies to indicate who may have already had the disease, in order to manage the spread of the disease in a controlled manner as we try to begin opening parts of the economy
  - Contact tracing, to allow a more surgical approach to managing the disease
  - A centralized surveillance system, at the regional or national level, that will provide an early warning and allow quick management of new outbreaks
- Preliminary analyses suggest that parts of the US and much of Europe is several weeks to a month from scaling these capabilities

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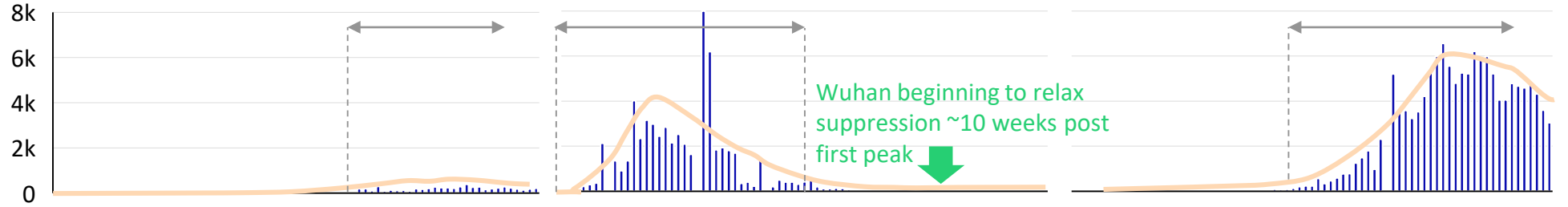
HOW LONG MUST WE LIVE WITH CURRENT SUPPRESSION MEASURES?

Local pandemic progression archetypes[1]



	Norway ~ 4+ weeks Case growth flattened immediately	**Hubei ~ 7-8 weeks** Sharp peak of very high case load, sharp decline	**Italy ~ 7+ weeks** Sharp incline, just now beginning to decline from first peak
What was closed:	• Schools • Non-essential businesses • International travel • Intra-country regional travel • Public gatherings >10 • Mandatory quarantine for sick/contacts/suspected	• Incoming/outgoing travel restrictions • Public transportation shutdown • Public gathering closures • Non-essential business closures • Stay-at-home mandatory • School closures (after existing Lunar new year holiday)	Lombardy lockdown, later extended nationally: • Incoming/outgoing travel restrictions • Public transportation shutdown • Public gathering closures • Work from-home mandatory • School closures • All outdoor activity banned • Non-essential businesses closed
What has re-opened:	• Nothing yet, but health minister has declared an end to the outbreak and kindergartens will reopen and intra-country travel restrictions will be released 4/20 • All schools and "one-to-one" businesses (e.g. hairdressers) reopen 4/27	• Public transport resumes • Some businesses reopen (manufacturing & industrial) • Outgoing travel restrictions lifted • Stay-at-home mandate eased	• Lombardy still in total lockdown • Elsewhere in Italy - some businesses reopened: bookshops, children's clothing stores, laundromats • Plan additional reopening on 5/3
What to watch for next:	• Will reopening schools cause a resurgence or can they safely be an early measure to relax?	• Many restrictions still exist (schools closed, WFH encouraged, large gatherings prohibited): will the outbreak return even with these restrictions in place?	• Active cases are still high, healthcare system is exhausted; can even a minor renewed outbreak be managed?

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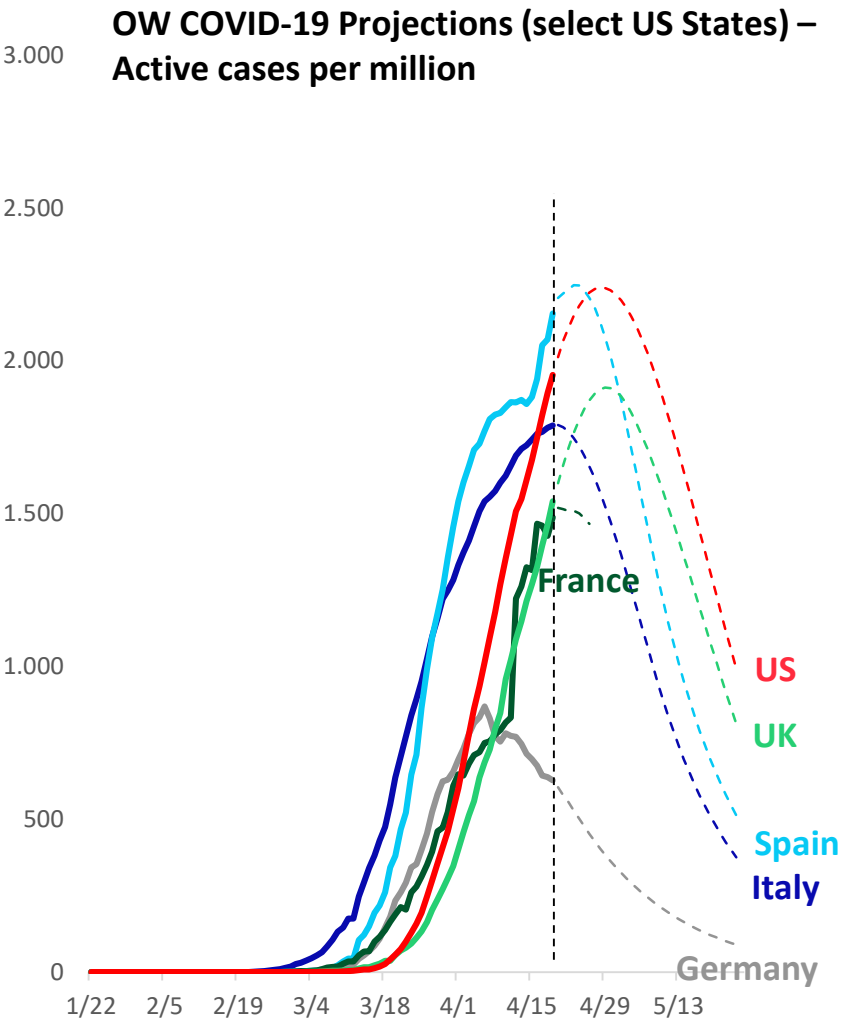
WHAT WILL IT TAKE TO REOPEN AND WHEN WILL WE GET THERE?

Capability	*Where are we?*
Health system capacity The personnel, PPE, beds, and other equipment to sustainably manage normal healthcare needs and a potential new surge	Most countries and US states have sufficient capacity though a few hot spots remain overwhelmed/at the margin (Italy, NY, Spain, UK)
Testing Sufficient rapid testing to screen essential workers, conduct random testing, effectively contract trace and ID new flareups	US as a whole and many European countries lack adequate capacity, some European and Asian Countries (Germany, Norway, S. Korea) have adequate supply
Contact tracing Identification, testing, and isolation of infected individuals' contacts	Most countries lack adequate capacity; rapid staff up and creation of technological tools are beginning to fill the gap
Central surveillance Processes and infrastructure for aggregating an analyzing data to drive decision-making around suppression strategies	Asian countries have led the way, and existing surveillance systems are being adapted elsewhere but face data and lag time issues
Social distancing Cultural, and infrastructural changes to daily life and work	Businesses and individuals are just beginning to grasp the extent of the new normal



1. For additional details see slide XX in appendix

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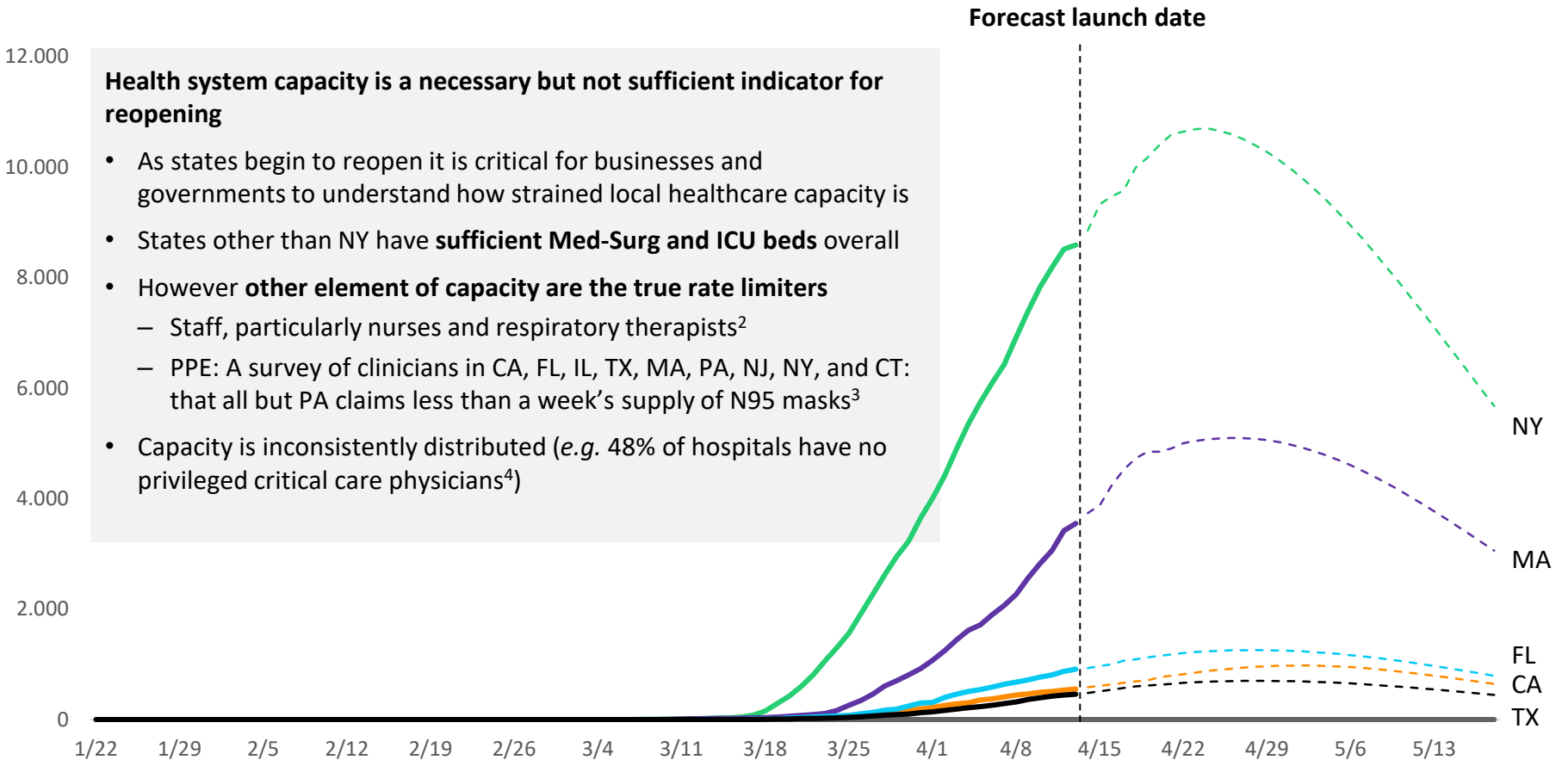
HEALTH SYSTEM CAPACITY IN THE USA

Some states are at the top of health system capacity while others have bed capacity but may lack personnel and PPE

OW COVID-19 Projections (select US States) – Active cases per million



Health system capacity is a necessary but not sufficient indicator for reopening

- As states begin to reopen it is critical for businesses and governments to understand how strained local healthcare capacity is
- States other than NY have **sufficient Med-Surg and ICU beds** overall
- However **other element of capacity are the true rate limiters**
  - Staff, particularly nurses and respiratory therapists[2]
  - PPE: A survey of clinicians in CA, FL, IL, TX, MA, PA, NJ, NY, and CT: that all but PA claims less than a week's supply of N95 masks[3]
- Capacity is inconsistently distributed (*e.g.* 48% of hospitals have no privileged critical care physicians[4])

1. Reflects capacity *before* emergency capacity expansions undertaken by many states. 2. Disaster Medicine and Public Health Preparedness (link). 3. GetusPPE (link) 4. Critical Care Medicine (link).

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HEALTH SYSTEM CAPACITY IN EUROPE

The situation in Europe, particularly ICUs varies widely by country and region, with particular areas in Italy and Spain facing more cases than total capacity and UK nearing capacity

OW COVID-19 Projections (select European countries) – *Total* active cases per million

Italy[1]

- As it neared the peak, Lombardy was operating at >150% pre-pandemic capacity

Spain[2]

- By the peak, Spain was operating at nearly double initial ICU capacity of 4.4K beds

UK[3]

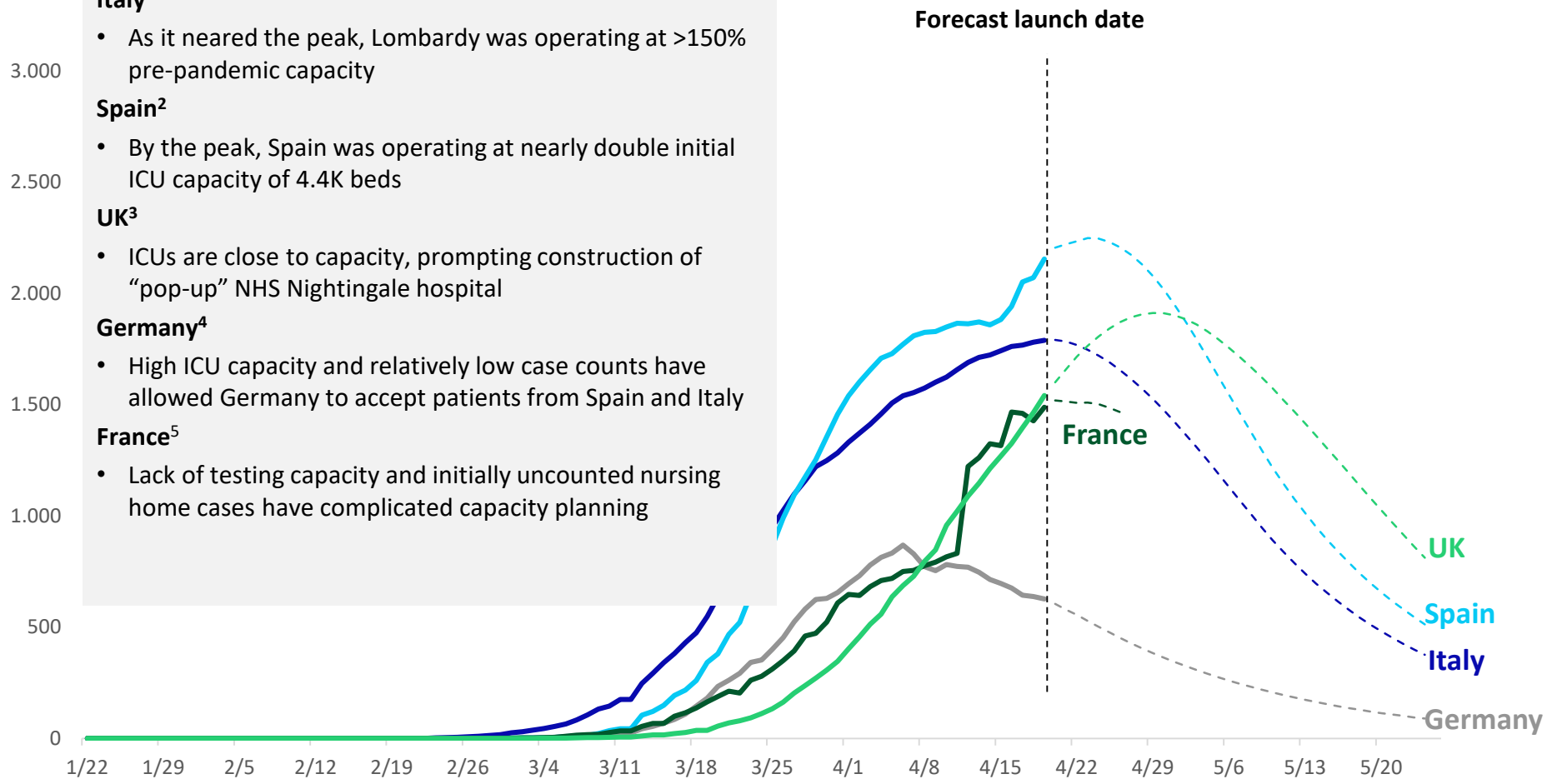
- ICUs are close to capacity, prompting construction of "pop-up" NHS Nightingale hospital

Germany[4]

- High ICU capacity and relatively low case counts have allowed Germany to accept patients from Spain and Italy

France[5]

- Lack of testing capacity and initially uncounted nursing home cases have complicated capacity planning



1. Bulletin of the WHO (link). 2. El Pais (link). 3. Health Service Journal (link) 4. The Independent (link) 5. Connexion (link)

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TESTING IS A CRITICAL TOOL TO PINPOINT INFECTION AND UNDERSTAND SPREAD NOW AND AS WE RELAX SUPPRESSION MEASURES

Two types of COVID-19 tests will play a critical role in COVID-19 management

	COVID-19 Genetic Material (mRNA) Polymerase Chain Reaction Swab Tests	Antibody Serology Test
Description	• **Best for diagnosis** - Used to detect active infections through COVID-19 mRNA identification via PCR tests	• **Best to identify prior contraction of disease** - Blood tests to detect antibodies, innately created to fight COVID-19 infections by the body
Importance	• Rapid tests to diagnose COVID-19 are needed to allow swift countermeasures • Widely available and routine testing protocols are needed to identify emerging outbreaks • Once social distancing has had its effect, testing will be a return-to-normalcy tool	• Serological tests will elucidate true scope of the pandemic post-hoc – testing gaps and asymptomatic patients to date have stymied understanding • Will also give insight into what happens to people who have been infected in terms of future immunity and/or infectiousness (currently unclear if infection confers future immunity)
Status	• Testing capacity, effectiveness, and rapidity is increasing • As of 4/9, 31 companies have received FDA emergency authorization to conduct their rapid tests[1]	• Many companies still in test development • As of 4/9, only 1 company has received FDA emergency authorization to conduct their rapid tests (Cellex)[1]

Source: 1. FDA (link).

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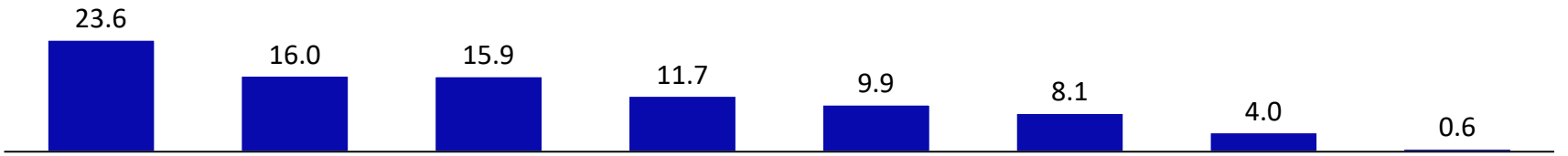
MANY COUNTRIES HAVE EXPANDED TESTING CAPACITY BUT ADDITIONAL CAPACITY IS STILL REQUIRED TO SAFELY END SUPPRESSION

Tests per thousand people (Data as of 4/9/20)[1]



	Norway	Italy	Germany	Czech Republic	South Korea	USA	UK	Japan
Tests/ Confirmed case	22	7	13	26	50	7	5	21
Day 0: 100 confirmed cases	3/6	3/1	2/23	2/20	3/13	3/3	3/5	2/21
Target test/day[2]	2.8 K	54K	62K	2.9K	6.2K	290K	57K	6.3K

	Managing the Outbreak	Beginning to Open Up	Broader Relaxation
Where we need to be	Test all symptomatic patients and close contacts, rapid results	Test all, or a high proportion of employees returning to work and intracountry travelers	Test a broad enough portion of the population to yield <5% positive rate
Where we are	• US alone would need >750K tests per day total, but capacity may be sufficient outside major hot spots; **currently plateaued at 150K/day with decrease in daily tests recently**[3] • UK and Italy also under capacity • Czech Republic, Norway, Germany, have maintained low enough daily new cases to avoid overwhelming test capacity	• US employs ~30M in retail, education, entertainment, transport and other priority non-WFH industries: at current testing rate, that would require 200 days to test all: acceleration is necessary- even a random sample of 25% would require >1 month • Assuming similar employment patterns, European countries face similar needs to accelerate	• Conservative test/day target to allow broader relaxation is double current US rate • Most European countries are also well below the required rate, with Norway and Czech Republic, with relatively small outbreaks, the closest • Expansion of testing capacity and reduction in new cases may result in adequate testing in the next 4-6 weeks

1. Our World in Data (link) – testing units vary by country as different types of data are reported; 2. Assuming target 5% positive rate. Based on daily new case rate of 50% of the peak three day average of new cases, and that 90% of active cases are identified; 3. NBC News (link)

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EFFECTIVE CONTACT TRACING ALLOWS TARGETED ISOLATION TO AVOID THE NECESSITY FOR BROAD SUPPRESSION

Contact tracing and selective isolation: general approach

- Scaled tracing capabilities (using existing data sources or new technology) and a significantly increased public health workforce
- Scaled abilities to enforce and support quarantine (e.g., food delivery, isolation support, community-based treatment for quarantined individuals)
- China, S. Korea, Israel, and Singapore have used highly sophisticated approaches to contact tracing
- S. Korea demonstrated that mass messaging is critical as the outbreak grows[3]
  - Encouraging those with potential exposure to get tested
  - Targeted broadcast of the movement of infected individuals to alert those who were exposed

What does it take to be successful?

- Depending on speed to isolate contacts and success in isolating infected individual, models suggest a 70-85% success rate is necessary to control spread, if R0 is ~2[1], with higher R0s requiring higher success rates[3]
  - If all infected individuals are successfully isolated and all contacts are found in <2 days, the low end of the range is sufficient
  - If fewer than 80% of infected individuals are isolated or tracing takes 2 days, the higher end of the range is necessary
  - If tracing takes >2 days on average, control is nearly impossible to obtain
- Rapid tracing requires a massive workforce (at least 30K in US)
- Speed and manpower deficits can be addressed with digital tools in development for mid-May in US, already deployed in Europe and Asia

Where are we today?

- US states and localities are already moving to expand capabilities Massachusetts hiring 1K workers in partnership with Partners in Health non-profit, SF training 100 librarians, med students, and nurses[2] and Rhode Island and Massachusets have partnered with tech vendor Salesforce.com to scale contract tracing capabilities[5]
- Census Bureau will reportedly repurpose 25K workers to aid in contact tracing[6]
- Indication of European success: Germany's low CFR suggests high identification rate, driven by high contact tracing capacity

State-level initiatives and promise of digital support by mid-May indicate contact-tracing in the US within weeks, sooner in Europe where digital tools and tracing workforces are already in place

Sources: 1. Science Magazine (link); 2. StatNews (link); 3. Lancet (link); 4. NY Times (link) 5. NECN (link) 6. NY Times (link)

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SIGNIFICANT NEW CONTACT TRACING RESOURCES ARE REQUIRED IN THE US TO BEGIN REOPENING

The European CDC has estimated necessary resource at the case level

- For each infected individual
  - Contact identification: 8 hours of administrative time over a 2 day period
  - High risk case isolation and monitoring: 84 hours of public healthcare worker time over two weeks
  - Testing of symptomatic contacts: Combined six hours of clinical and admin time
  - Low risk case monitoring: <1 hour

Total: 100 hours per infected individual

- ~2 FTEs per infected individual over the course of 2 weeks
- May need more as clinical work could be a bottleneck

What does that mean for the US's current plans?

- Overall US Goal of 30K contact tracing workers (supplemented by 25K Census Workers):
  - Implies ability to manage ~7500K cases/week or ~1000K new cases a day
  - Far below projections in the near term
- Use of technological tools may reduce the personnel hours required
  - Bluetooth-enabled contact-tracing apps (available in US mid-May)
  - Repurposing of customer management software (*e.g.* MA and RI with Salesforce)
- ECDC assumptions for number of high risk contacts (36) is high, especially assuming social distancing is maintained
  - In a socially-distanced context, these assumptions may be an order of magnitude lower, implying capacity to do >10K new cases a day– US will be there in mid-May
- Requirements may vary heavily by region given effects of different cultural contexts on social behavior

1. Assumes 90 total and 36 high risk contacts

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AN EFFECTIVE SURVEILLANCE SYSTEM IS CRITICAL TO DETECTING NEW OUTBREAKS EARLY ENOUGH TO MANAGE WITHOUT WHOLESALE SUPPRESSION

What do we need?

Data

- Enough COVID-specific testing is taking place to provide a reliable view of COVID prevalence
- Availability of additional clinical and other data that can indirectly ID COVID prevalence (e.g., disproportionately high hospitalization rates for older individuals with pneumonia, travel from hot spots)

Central Aggregation

- Infrastructure and processes to rapidly aggregate data at a geographic level that:
  - Is empowered to make COVID management decisions accounting for any delay in data reporting and aggregation
  - Is large enough to cover the extent of COVID outbreaks (i.e. beyond one state when there is significant interstate commuting)

Analytics

- Analysis that identifies when COVID outbreaks threaten to escape control and guides decisionmakers

When can we get there?

- Testing capacity is likely to remain below requirements for the US and many European countries at least for another month
- Additional clinical data may help fill gaps in testing but these data are difficult to aggregate effectively in the US and are unlikely to be a short term aid
- European countries with more centralized healthcare/ financing systems may be able to leverage additional data, as some Asian countries did in combining immigration with health information

- The US's National Syndromic Surveillance System has been deployed for COVID tracking, and covers the majority of hospitals in the US, but using it as an early warning system for outbreak resurgence requires broader data gathering and a reduced lag time
- State/multi-regional initiatives are underway but timing is unclear

- As experience with of COVID is gained during the first wave, modeling the second wave will become easier

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TO AVOID THE USE OF BLUNT SHUTDOWNS, COUNTRIES NEED SURVEILLANCE SYSTEMS AND THE CAPACITY TO TRACE MOST INFECTED INDIVIDUALS' CONTACTS

Most invasive ← → Least invasive

Case Study: China[1]

- **The Alipay Health Code**:
  - Program originated in Hangzhou, China; as of 2/24 90% of the province's population had downloaded the app and 100 Chinese cities were using it
  - Uses big data to determine if an individual is a contagion risk or not
  - Individuals are assigned a green, yellow, or red color code that indicates health status
  - QR code on phone is required for entry into many common areas, public transportation, health checkpoints, etc
  - App shares personal data including location with the police

Case Study: South Korea[2]

- **Tracking**:
  - Retrace physical steps of anyone who tested positive
  - Used credit card records, GPS data and security-camera footage
- **Mass messaging:**
  - Emergency cell phone alerts any time there is a confirmed case in individual's district
  - Apps and websites list detailed timelines of infected individuals' travel
  - Anyone having potentially crossed paths with individual urged to go to testing center
- **Quarantine enforcement:**
  - Quarantined individuals required to have cell phone apps that alert officials if they venture out with fines for violations

Case Study: Germany[3, 4]

- **Pan-European Privacy Preserving Proximity Tracing (PEPP-PT)**
  - Heavy focus on preserving individual privacy, while allowing tracking and tracing
  - Doctors would get permission from those who test positive and enter their information into a central server
  - System uses Bluetooth to log a user's proximity to other cellphones, without storing data from location tracking
  - Users then receive a message if they have been in close contact with someone who has tested positive for COVID-19
  - The German government is aiming to launch the app by mid-April

Sources: 1. NY Times (link) 2. NY Times (link) 3. NPR (link)

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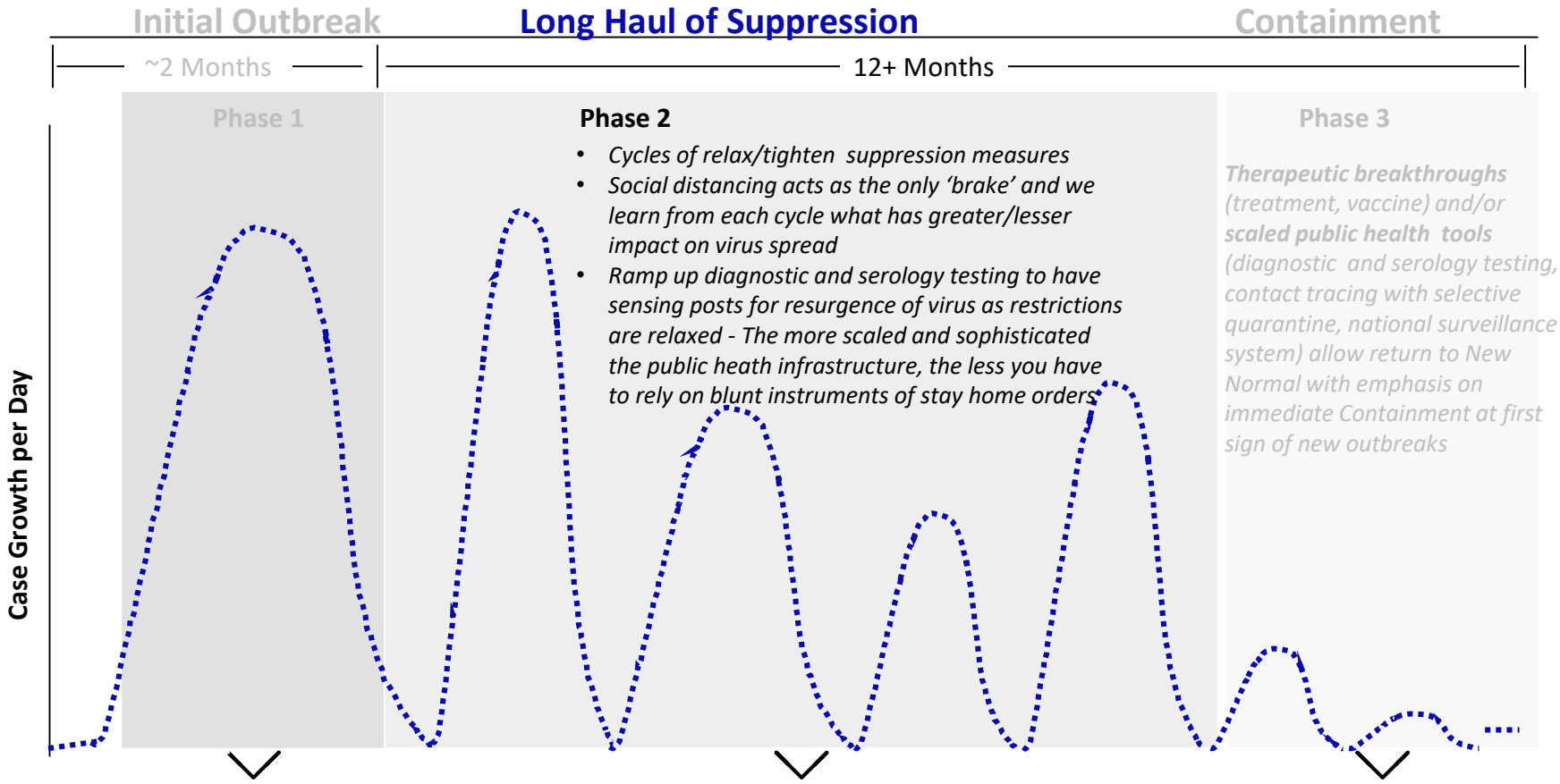
Illustrative

MANAGING THROUGH PHASE 2



Mitigation/Economy

- Closure of non-essential businesses
- Community-wide stay-at-home mandates
- Widespread remote work
- Border closures and travel restrictions

- Gradually reopen some business *(e.g., retail / restaurants/ manufacturing with social distancing and cleaning/protection protocols)*
- Strict quarantine guidelines for confirmed cases, close associates and travelers
- Stay-at-home order for at-risk people
- Remote work and mask-wearing still the norm
- No large gatherings (e.g. no events >50 people) so churches, sports, entertainment venues remain closed
- Travel to / from hot spots restricted

- All businesses re-open, under mandated safety protocols
- Stay-at-home reinstated in areas with renewed outbreaks
- Prevalent use of vaccines, perhaps annually

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HOW DO WE DETERMINE WHAT TO REOPEN WHEN?

Premature relaxation of suppression would have obvious public health costs, but overlong suppression will be painful as well from economic and health perspectives; what is the balance point?

Continued Suppression

Positive effect

Greatly reduce risk of public health catastrophe

Economic implications

Failed businesses

Supply chain disruption creates true shortages

Massive long-term unemployment

Public health implications

Significant decline in mental health

Lower quality of life and premature death as important elective surgeries are canceled

Loss of key healthcare resources to financial ruin

Increase in lifestyle diseases as diet and exercise habits worsen

Near Term Relaxation

Positive effect

Near term economic boost

Public health implications

High levels of death and permanent disability

Crippling of the healthcare system through workforce exhaustion and illness and facility capacity strain

Economic implications

True shortages created by supply chain disruption due to illness

Many businesses fail regardless of relaxation due to customer mistrust

Uncertainty surrounding likelihood of returned suppression makes investment unattractive and creates a financial crisis

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CAREFUL GOVERNMENTS WILL SEEK TO RELAX RESTRICTIONS OVER TIME BASED ON THE RELATIVE RISK VS. ECONOMIC BENEFIT OF REMOVING EACH RESTRICTION

Factors to drive restriction easing

The **reduction in risk** of COVID transmission driven by a given restriction

- Reduction in number of contacts
- Risk of transmission associated with each contact

Economic impact of relaxing / maintaining a given measure

Example sequence of restriction easing

The ideal sequence and timing may change as different regions experiment

	Restrictions	Day-to-day activity	Business protocols
Phase II *(6-8 wks from today)*	• Large gatherings in constrained spaces • "Stay at home" for elderly and high risk • Knowledge workers work from home • Limited international travel • Potential closures of areas that cannot be regularly cleaned	• Limited personal contact outside of work • Mandated mask use in public • Mandatory quarantine for anyone who has travelled to hotspot location	• Opening of "in-person essential" business with requirements for social distancing and employee monitoring • New standards for cleaning and disinfection
Phase III	• Restrictions will depend on efficacy of mitigation, availability of testing and tracing, therapies and potential immunity • This phase is months, not weeks, away		

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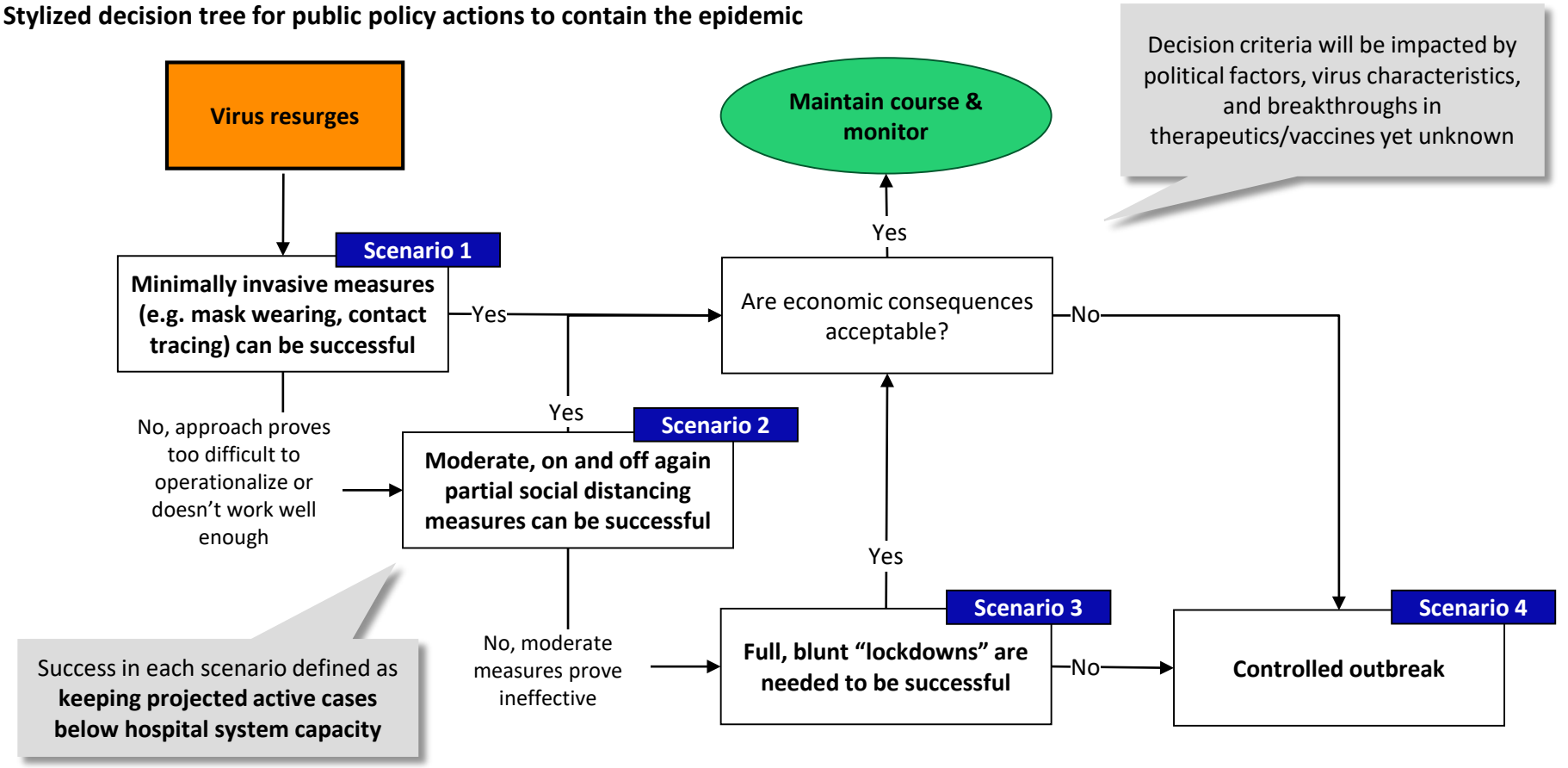
SOCIETIES AROUND THE WORLD WILL BE LOOKING TO CONTAIN THE PUBLIC HEALTH DISASTER WHILE MINIMIZING IMPACT ON THE ECONOMY UNTIL A VACCINE EMERGES

Stylized decision tree for public policy actions to contain the epidemic



We are continuously monitoring global government responses and results across the world, incorporating them into our COVID-19 Pandemic Navigator, and creating sophisticated "what-if" scenarios

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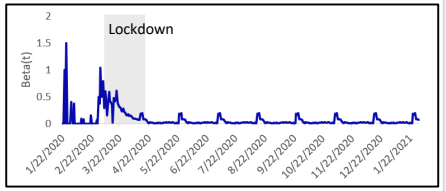
SMART SCENARIOS FOR THE FUTURE COURSE OF THE EPIDEMIC CAN BE DEVELOPED AT COUNTRY AND STATE LEVEL AND USED TO PROJECT CONSEQUENCES OF POLICY AND BUSINESS CHOICES

1

Minimally invasive measures

- We sacrifice privacy and some freedoms, but suppress the virus
- Regional borders remain controlled/closed to avoid contagion

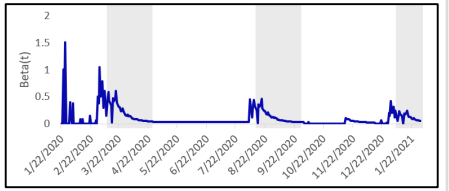


Targets for no future outbreaks occur, and we are able to maintain a reasonable level of economic activity

2

Moderate social distancing

- We have few slower-growth outbreaks over the next 18+ months
- When case counts reach a critical threshold against hospital capacities, stricter lockdowns imposed

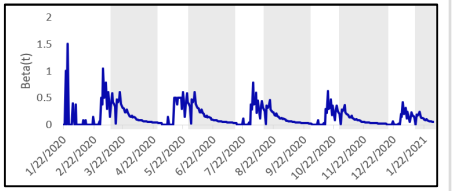


Economic impacts are significant but lower than that with minimally invasive measures

3

Blunt lockdowns

- We will periodically be in 'today's world' over the next 18+ months
- Fiscal and monetary stimulus measures expand significantly to account for future outbreaks

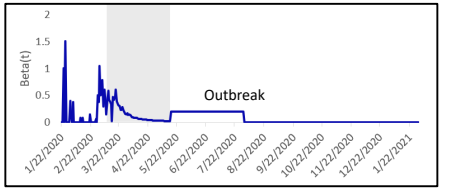


Impact on most affected sectors of the economy will be deep and long-lasting

4

Controlled outbreak

- The virus spreads quickly through the general population
- Potential for future outbreaks depends significantly on the immunity of those previously infected



Immediate impact on economy is severe, but the pandemic is relatively short-lived

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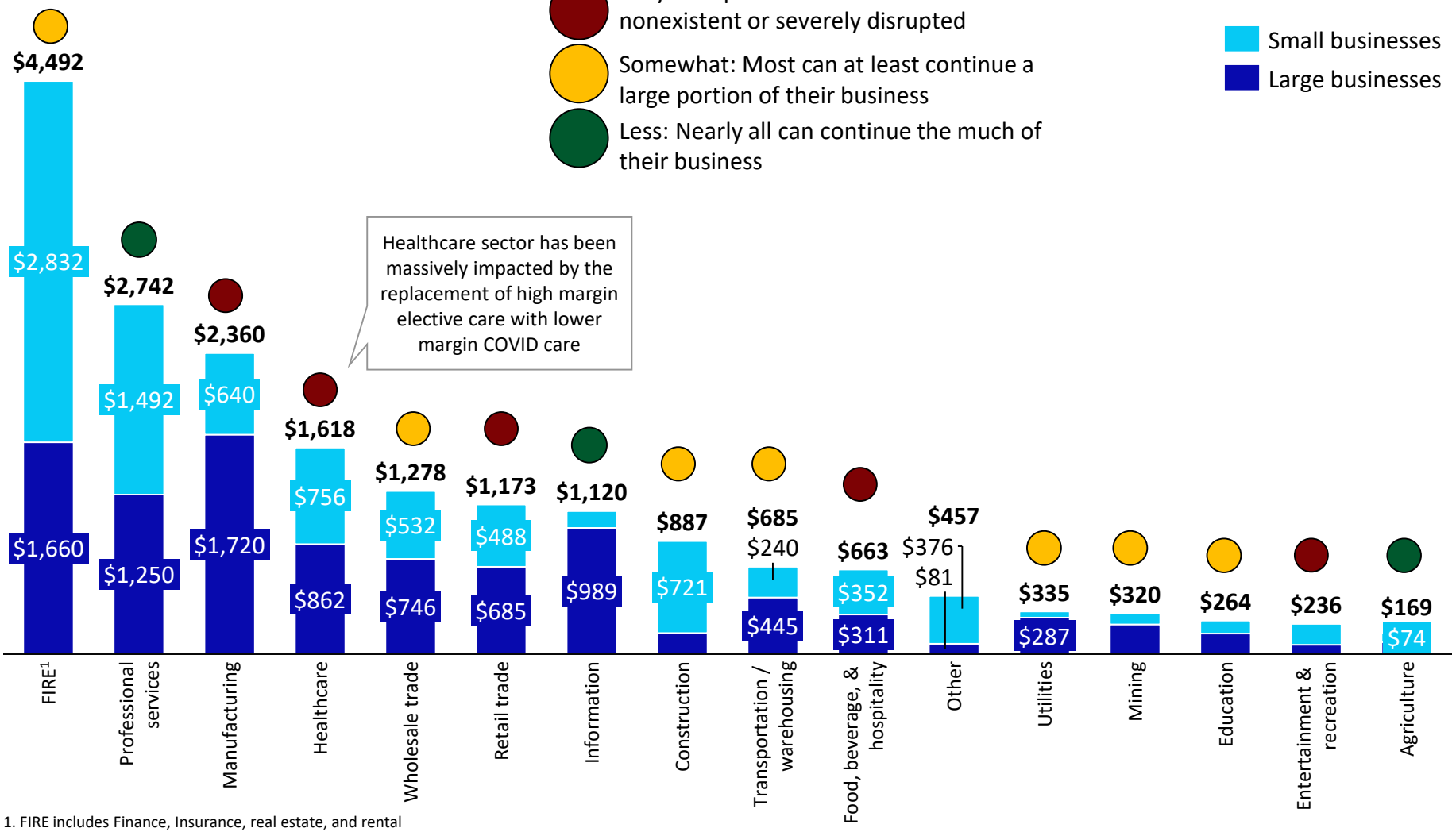
SCENARIOS SHOULD ACCOUNT FOR RELATIVE 'BANG FOR THE BUCK' ECONOMICALLY…

United States GDP by Industry, 2019

$ BN



1. FIRE includes Finance, Insurance, real estate, and rental

Source: US Bureau of economic analysis; US small business administration

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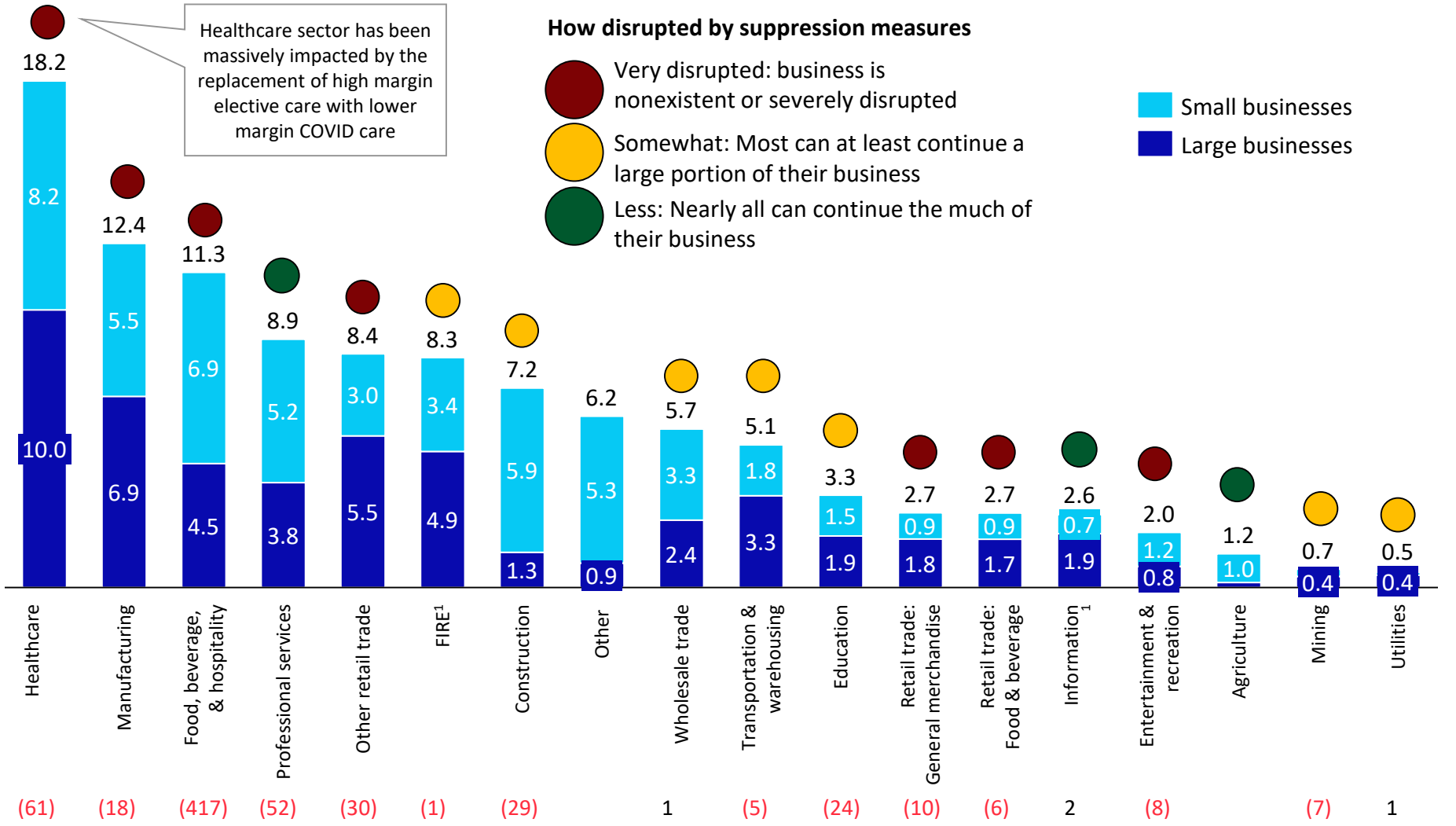
… AS WELL AS GETTING PEOPLE BACK TO WORK.

United States Employment by Industry, 2018
Full Time Employee equivalents, MM



Job Changes in 1000s, March 2020 jobs report, seasonally adjusted 1-month net change

1. FIRE includes Finance, Insurance, real estate, and rental
Sources: 1. US Bureau of economic analysis; 2. US small business administration

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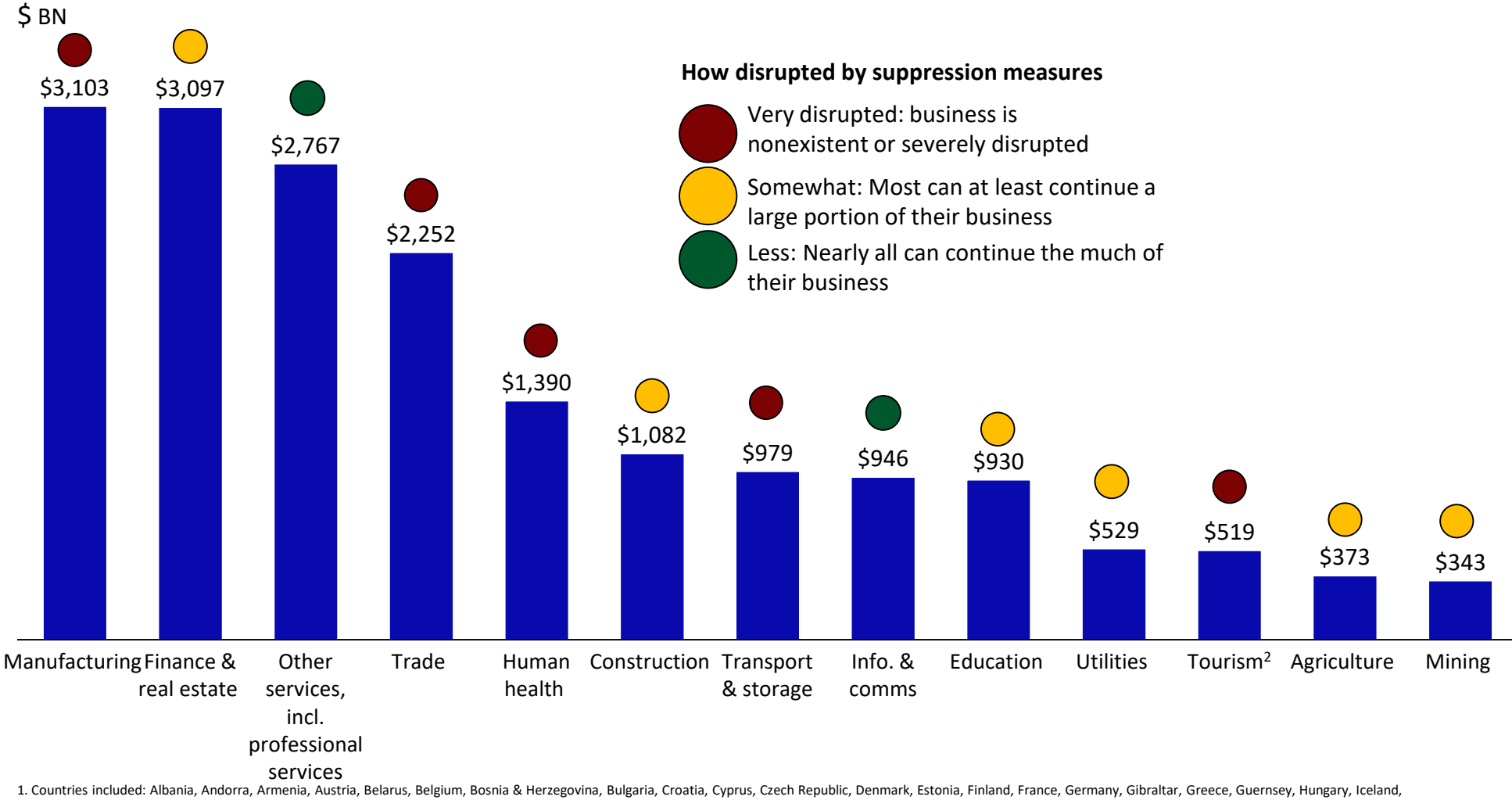
BANG FOR THE BUCK MAY DIFFER BY GEO AS ECONOMIC DRIVERS DIFFER- EUROPE HAS A HIGH FOCUS ON KNOWLEDGE INDUSTRIES BUT ALSO IN MANUFACTURING

Europe

European[1] GDP by Industry, 2018



1. Countries included: Albania, Andorra, Armenia, Austria, Belarus, Belgium, Bosnia & Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Gibraltar, Greece, Guernsey, Hungary, Iceland, Ireland, Isle of Man, Italy, Jersey, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Montenegro, Netherlands, Macedonia, Norway, Poland, Portugal, Romania, San Marino, Serbia, Slovakia, Slovenia, Spain, Svalbard, Sweden, Switzerland, Ukraine, UK, Vatican; 2. Tourism includes hospitality and food & beverage sectors

Source: Fitch Solutions - FitchConnect

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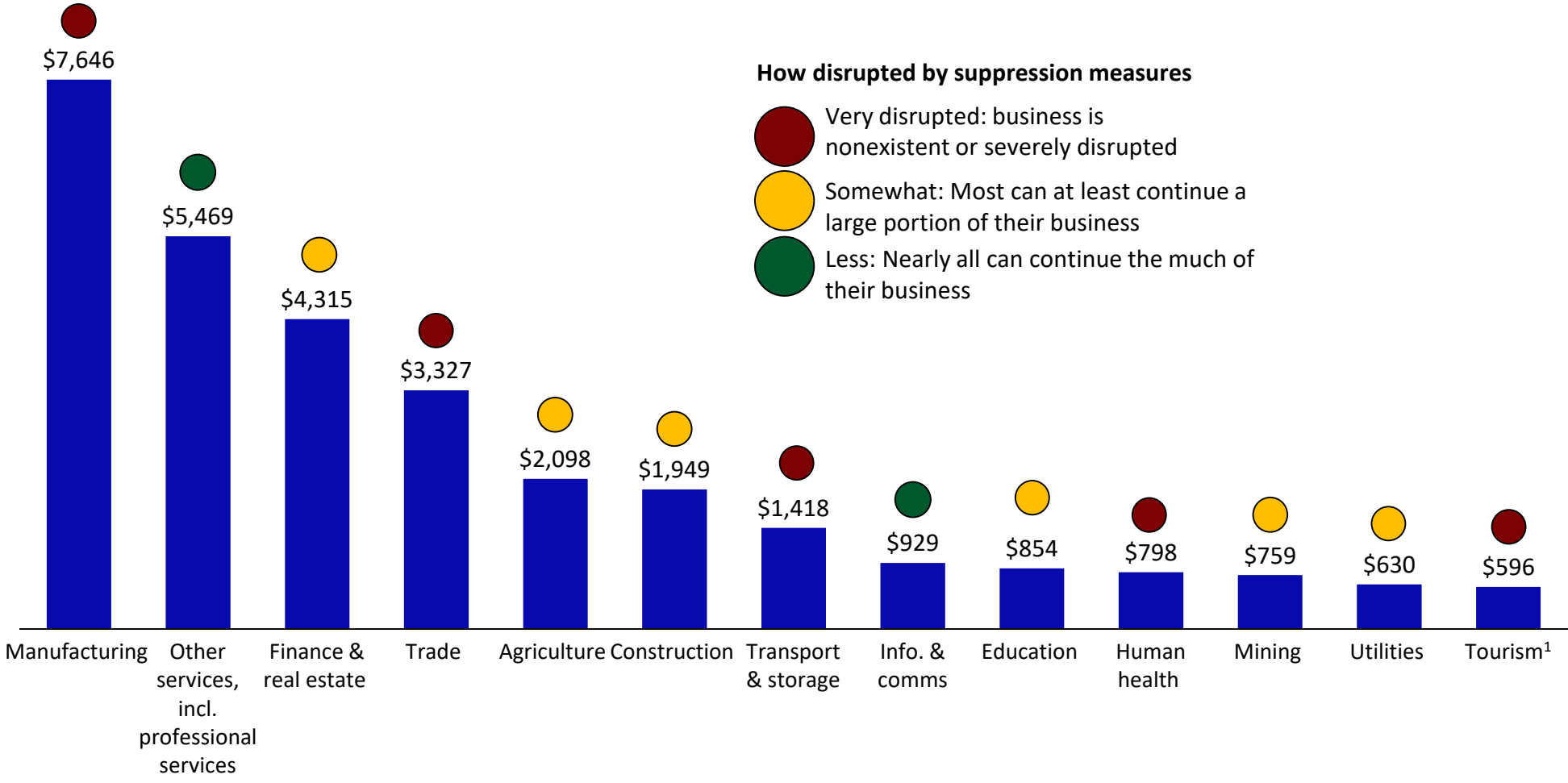
MANUFACTURING REPRESENTS A MUCH BIGGER PORTION OF THE ECONOMY IN ASIA

Asia/Middle East

Asian/Middle Eastern GDP by Industry, 2018

$ BN



1. Countries included: Afghanistan, Azerbaijan, Bangladesh, Bhutan, Brunei, Cambodia, China, Georgia, Hong Kong, India, Indonesia, Israel, Japan, Kazakhstan, Kyrgystan, Laos, Lebanon, Macau, Malaysia, Maldives, Mongolia, Myanmar, Nepal, North Korea, Pakistan, Phillippines, Singapore, South Korea, Sri Lanka, Taiwan, Tajikistan, Thailand, Turkey, Turkmenistan, Uzbekistan, Vietnam West Bank & Gaza; 2. Tourism includes hospitality and food & beverage sectors
Source: Fitch Solutions - FitchConnect

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CASE STUDIES: WHAT ARE GOVERNMENTS PLANNING? (1/2)

Several governments have released plans outlining their philosophies and approaches to reopening

Israel has a specific by-industry cascade but no set timeline or criteria for moving from phase to phase[1]

Four phases, potentially starting as early as April 16, each lasting at least two weeks, depending on COVID resurgence

1	• High employment industries that are easier to enforce social distancing rules within: tech, finance, import/export • Public transit • Preschool
2	• Retail, except malls • Elementary schools
3	• Restaurants, hotels • All schools
4	• Entertainment (including sports) • Flights

The US has defined a broad set of criteria and three more general phases that may vary at the regional level

Criteria

- Downward trajectory in documented cases, proportion of positive tests, or symptom prevalence for 14 days
- Health system out of crisis capacity mode
- Ability to test all health workers

Three phases

1	• Vulnerable individuals shelter in place • Social distancing observed by all and groups of >10 should be avoided • Non-essential travel minimized • Schools remained closed • Elective surgeries resume
2	• Vulnerable individuals shelter in place • Groups of >50 should be avoided • Schools reopen • Large venues (e.g. theaters) reopen with social distancing measures
3	• Vulnerable individuals remain cautious • Other activities can resume with caution

Sources: 1. Haaretz (link)

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CASE STUDIES: WHAT ARE GOVERNMENTS PLANNING? (2/2)

Several governments have released plans outlining their philosophies and approaches to reopening

California, has no set plan for what to reopen in what order but has instituted criteria stricter than the US a whole[2]

Six criteria for reopening

1	Capacity to test all symptomatic individuals and their contacts
2	Ability to predict medically vulnerable populations from infection
3	Capacity of health systems to manage potential surges
4	Existence of therapeutics that can be produced at scale
5	Ability of business and other public places to maintain social distancing
6	Existence of an early warning system to reimpose suppression if necessary

On April 22nd, California announced that elective surgeries would resume but gave no date for further reopenings

Germany is emphasizing slow reopening with the potential for returned suppression[2]

Plans will be reassessed on April 30th

Apr 20th

- All stores up to 8,600 square feet can reopen, subject to ability to maintain a hygienic environment
- All bookstores, bikeshops and car dealers can reopen

May 4th

- Schools reopen
- Hair salons reopen

Longer term

- Ban on public gatherings >2 to be reconsidered 4/30
- Ban on large gatherings at least until 8/31
- Bars, restaurants, heaters, religious services closed indefinitely

Sources: 2. California State Government (link) 2. New York Magazine link

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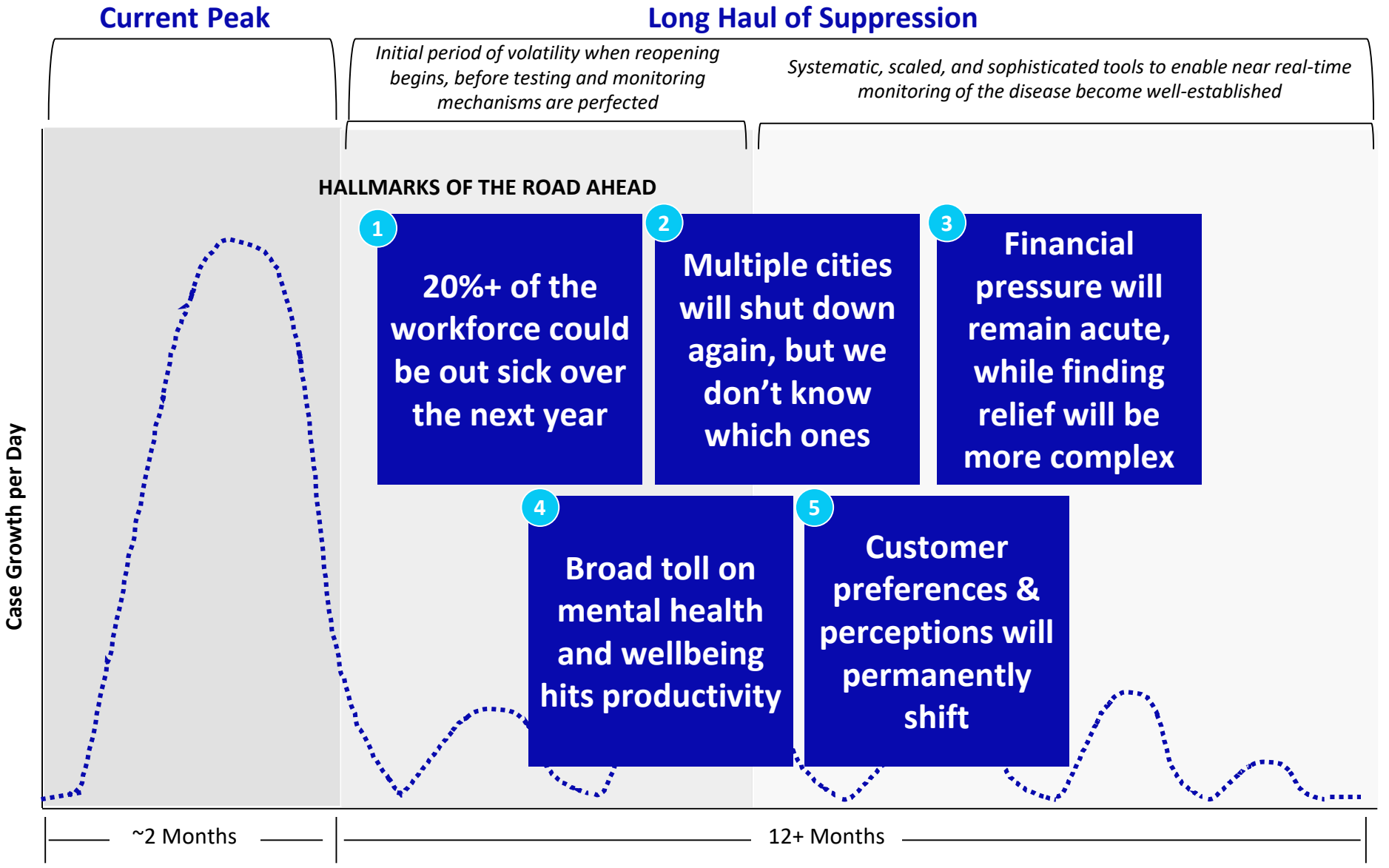
Illustrative

THE LONG HAUL OF SUPPRESSION IS MARKED BY PERVASIVE RISK OF DISRUPTION



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PERVASIVE RISKS LEAD TO CRITICAL QUESTIONS FOR ALL BUSINESSES TO ANSWER

1. ***20% of the workforce will be out sick***
2. ***Multiple markets will be shut down again***
3. ***Financial pressure will remain acute***
4. ***Shifting customer preferences and perceptions***

Workforce Resiliency and Readiness

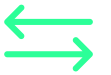
- What are my workforce risk exposures *(demog., health status, geo, skills)?*
- Am I prepared for unavoidable churn in of COVID in my workforce?
- Are my WFH solutions sustainable for me and my employees?
- How might we reorganize workspaces to mitigate risks?
- Are we appropriately maximizing use of alternative staffing models?
- Are we reinforcing our employee relationships through this experience?

Customer and Channel Strategy

- What customer activity is shifting to digital, and will that activity shift back?
- Am I positioned to win if the shift to digital accelerates?
- Am I preserving customer relationships to ensuring rapid return of demand?
- How do we ensure customer confidence in the safety of our sites?
- Are front-line staff prepared to tactfully deal with new concerns and new social norms?
- What emerging consumer concerns or pain points offer growth opportunities?

Operational Effectiveness

- Are we over-indexed in certain geos, can that be cost-efficiently reduced?
- Can we enhance portability of operations to relocate in a new surge?
- How might sites and processes be redesigned for resilience, efficiency, and social distancing?
- Can automation alleviate critical risk points and boost efficiency?
- Are our infrastructure and IT configured to enable our plans?



Supply Chain Risk Management

- Are contingencies set to mitigate disruption if a key supplier or geo goes down?
- Are we equipped to monitor and respond quickly to such risks?
- Have we reset inventory targets to mitigate top risks while staying efficient?
- Is our sourcing and distribution durable to spot shocks?
- Are we sharing the right information to support mutual planning and risk monitoring?

What areas of risk are of highest concern to your organization?

ILLUSTRATIVE PLAYBOOK COMPONENTS ON WORKFORCE RESILIENCE AND READINESS

PHYSICAL WORK SPACE SAFETY

- Floor layout redesigns and foot traffic guidance to reduce congestion and maintain 6 ft distance
- Temperature checks upon entry and exit
- Mid-day spot cleaning break for all employees
- Bans on in-person meetings with 10+ people
- Masks/gloves at all times in public spaces
- ….

ALTERNATIVE STAFFING MODELS

- Formal separation of A-teams and B-teams to ensure backup availability
- ‘Flex pool’ or ‘pool of pools’ to plug live gaps
- Reallocation of workforce across sites to mitigate undue risk in one location
- All who can work from home do so
- Cross-training of all critical skill sets
- …

MANAGEMENT OF SPECIAL PEOPLE SITUATIONS

- Formal identification of higher risk employees *(demographics, health status, rare skills)*
- Alternative work rotations and extended WFH for populations at higher health risk
- Enhanced HR admin capacity for special employee circumstances *(e.g., sick days, PTO, furlough, alternative work arrangements)*
- …

PROACTIVE MONITORING AND INTERVENTION

- Elevation of centralized risk monitoring function
- Real-time tracking and evaluation of all key risks
- SWAT teams for rapid intervention
- Contingency plans for opening / closing / relocating operations based on evolving local risk
- Alerts and compliance monitoring
- …

SCALABLE EMPLOYEE SUPPORT

- Transportation burden assistance *(e.g. to avoid subway use)*
- Mental wellbeing coaching, accessible resources
- Productivity training for remote collaboration
- Policy & technology provision for extended work-from-home for large portions of workforce
- Child care assistance for remote workers
- …

FUNCTIONAL REDESIGNS

- Workflow redesign to reduce hand-offs, complexity, and intensity of rare skills
- Automation of critical processes and processes with higher personnel risks
- Infrastructure and IT configured for enablement of full program portfolio
- …

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03

OW PANDEMIC NAVIGATOR: SCENARIO MODELING

OVERVIEW OF OLIVER WYMAN'S PANDEMIC NAVIGATOR

Supports private and public sector clients	• Draws on expertise from our Health & Life Sciences and Financial Services practices • Underlying models are physics-informed, data-driven yet causally confirmed and use-case specific
Projects detected and undetected cases under different containment choices	• Estimates future outcomes for both Detected (tested and officially confirmed) and Undetected (e.g. asymptomatic) cases • Compartmental model covers 40 countries and the 50 US states, updated continuously for emerging data
Evidence-based causal links	• Linkages with mobility and government response – core model index compared to Google's Community Mobility indices as well as Oxford's Government Stringency Index
Generates 18-36 month scenarios linked to underlying epidemiology and suppression	• Primarily descriptive in nature, rather than 'predictive' • Validated via near-term predictive powers for a given strategy – if the model doesn't give sensible forecasts for the next 30 days (given a set of assumptions) then I'm less likely to trust it
Economic impacts by sector modelled for scenarios	• Health outcomes are fed into modules which estimate the economic impacts on 40+ sectors of the economy

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OUR MODEL IS PHYSICS-INFORMED, DATA-DRIVEN YET CAUSALLY CONFIRMED (1/2)

We have linked out transmission rate model to independent, observable metrics for human interaction

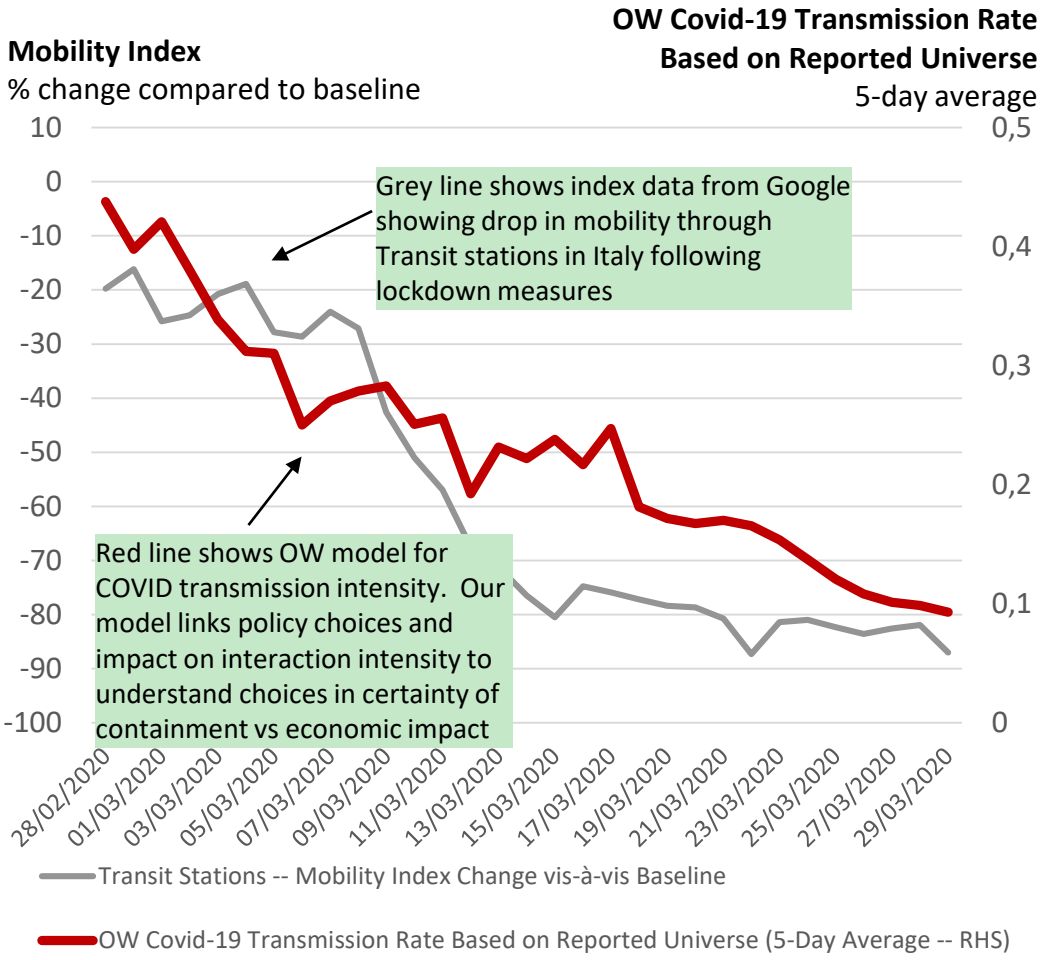
Google Mobility Indices reveal what has changed in movement activity; Oliver Wyman COVID-19 transmission rate measure confirms that social distancing worked in reducing spread of COVID-19 in confirmed/detected cases

Pick a region

- Pick a region
- Italy
- United Kingdom
- Sweden
- Czechia
- Brazil
- New York

Pick a mobility index

- Pick a mobility index
- Retail & recreation
- Grocery & pharmacy
- Parks
- Transit stations
- Workplace
- Residential
- Average of retail & recreation, transit stations and workplace



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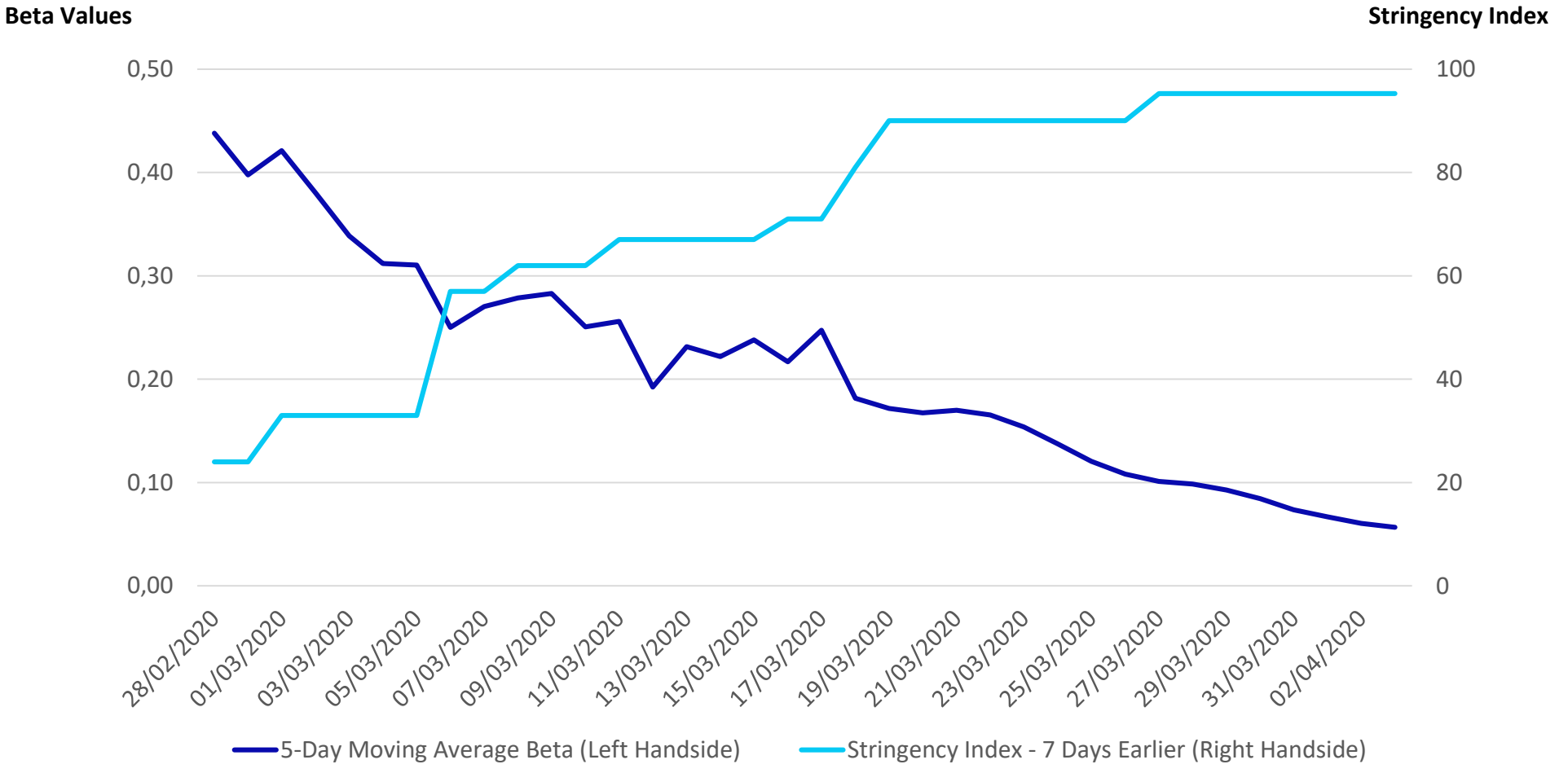
OUR MODEL IS PHYSICS-INFORMED, DATA-DRIVEN YET CAUSALLY CONFIRMED (2/2)

For example, the transmission rate model has been linked to the Oxford University Government Response Stringency Index



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OUR PANDEMIC NAVIGATOR CAPABILITY PROVIDES THE BASIS FOR MAXIMIZING MANAGEMENT LEAD TIME AND EFFECTIVENESS DURING THE PANDEMIC

1 Time and size of the next peak

2 Maximizing lead-time

3 Predicting policy failure

4 Scenario generation and calibration and sensitivity testing capabilities

1. City X or Country Y is experiencing a lockdown, when will it be over?

2. Providing real-time (daily+) predictions of the timing of the next lockdown to maximize lead-time for businesses (e.g. using mobile phone data)

3. Projecting where containment policy choices in City X or Country Y will fail and result in near-term lockdown

4. Providing a coherent, consistent set of planning scenarios which evolve as data emerges over coming weeks and months – enabling robust contingent action plans

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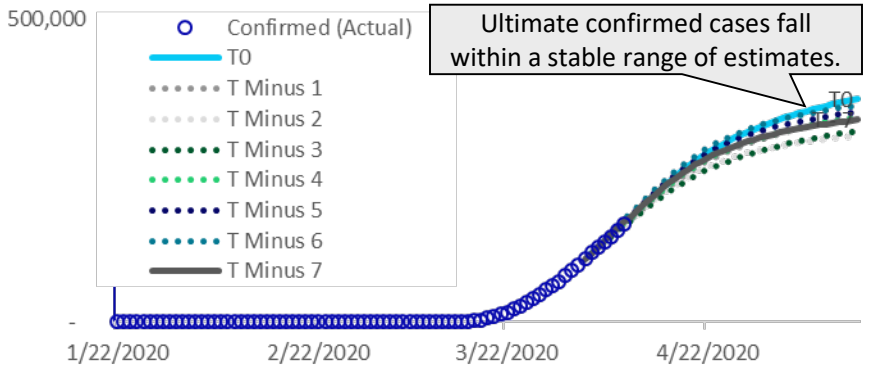
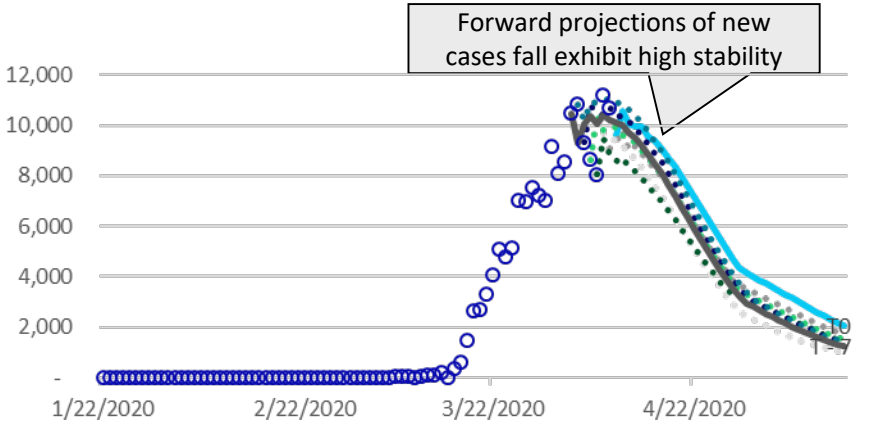
OUR MODELS HAVE BEEN GENERATING STABLE AND ACCURATE RESULTS. WE TRACK STATISTICAL TESTS EVERY DAY - RESULTS FOR NEW YORK STATE 4/10/2020

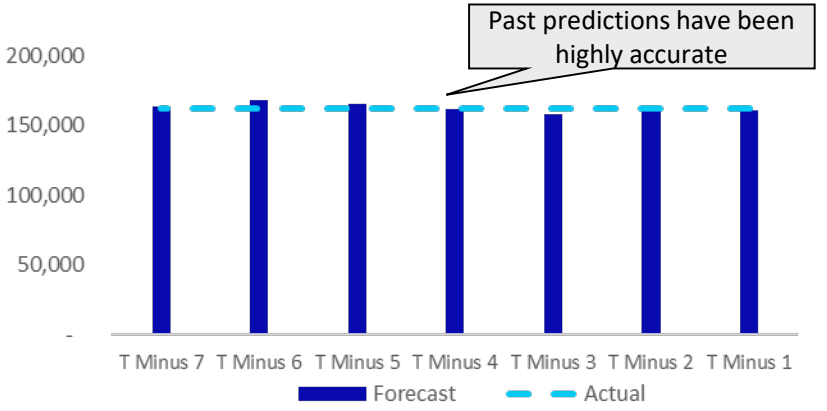
Forecasted trajectories for Confirmed Cases from yesterday (T0) and earlier projections from the previous 7 days



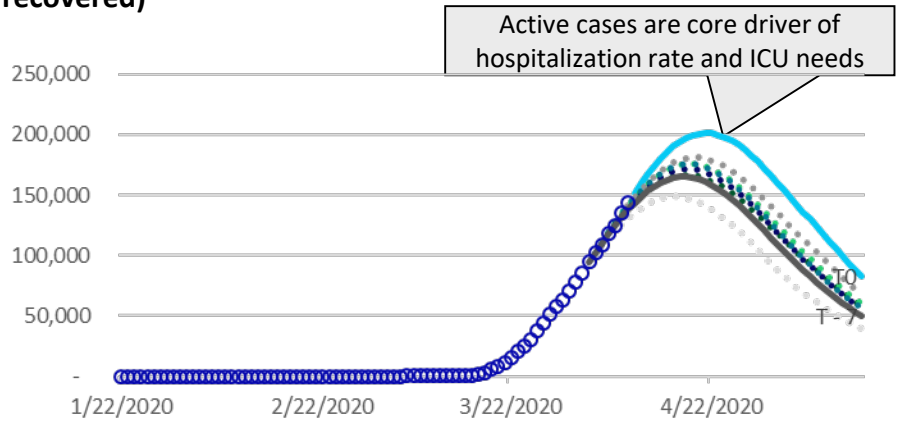
Forecasted trajectories for New Cases



Out-sample test results comparing Actuals 4/9/2020 with historically calibrated versions from the past



Forecast trajectories for Active Cases (confirmed-death-recovered)



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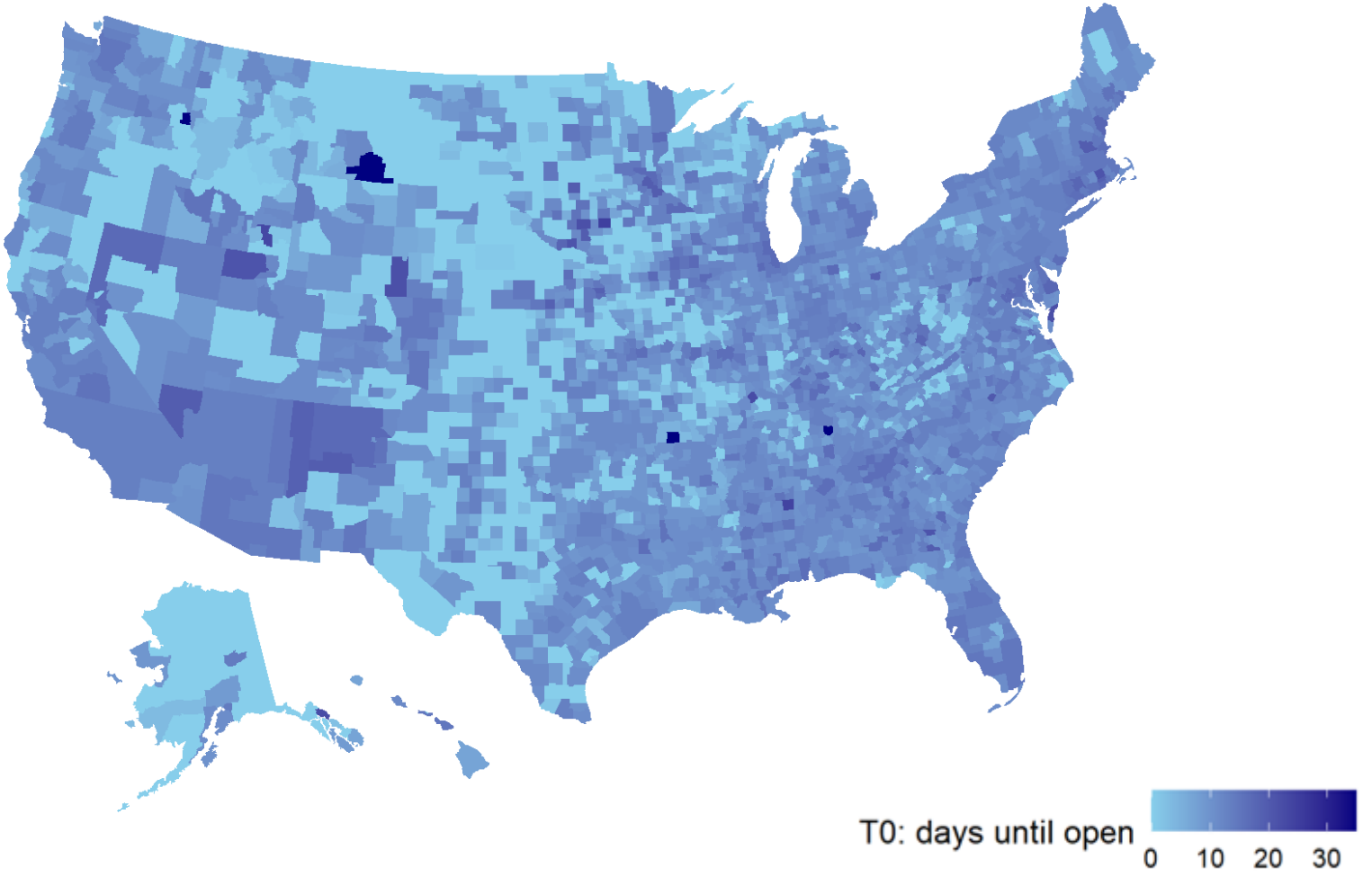
OUR PROJECTIONS ARE GRANULAR AND ALLOWS FOR SOPHISTICATED DECISION-MAKING – RESULTS FOR UNITED STATES AT COUNTY LEVEL 4/17/2020

Days from April 17, 2020 until county reaches 14-Day downward trajectory in New COVID-19 cases



Source: Oliver Wyman Pandemic Navigator

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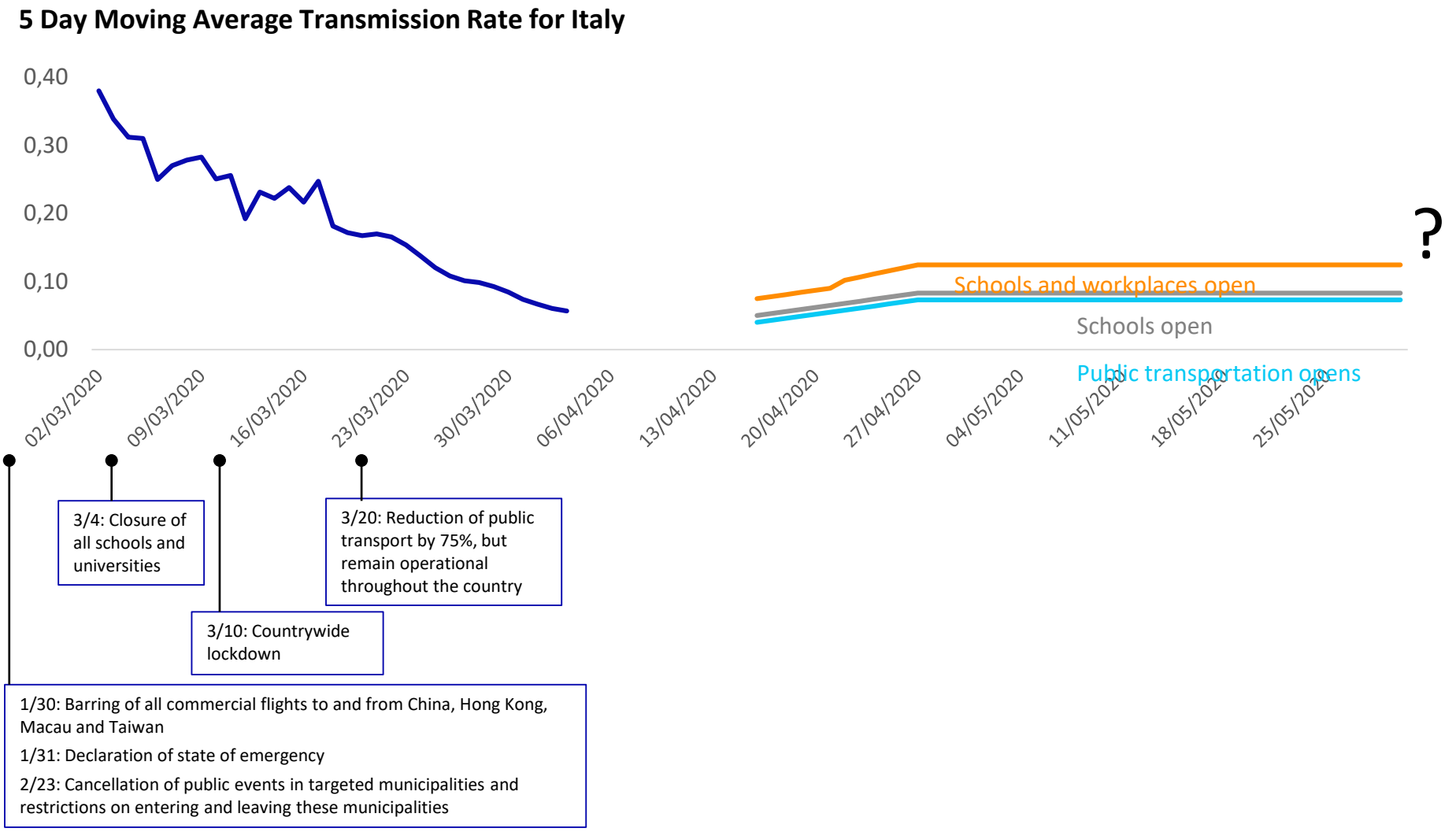
WE KNOW SOCIAL DISTANCING POLICIES WORK. BUT HOW WILL INFECTION RATE CHANGE WHEN GOVERNMENT / STATE POLICIES ARE LIFTED?



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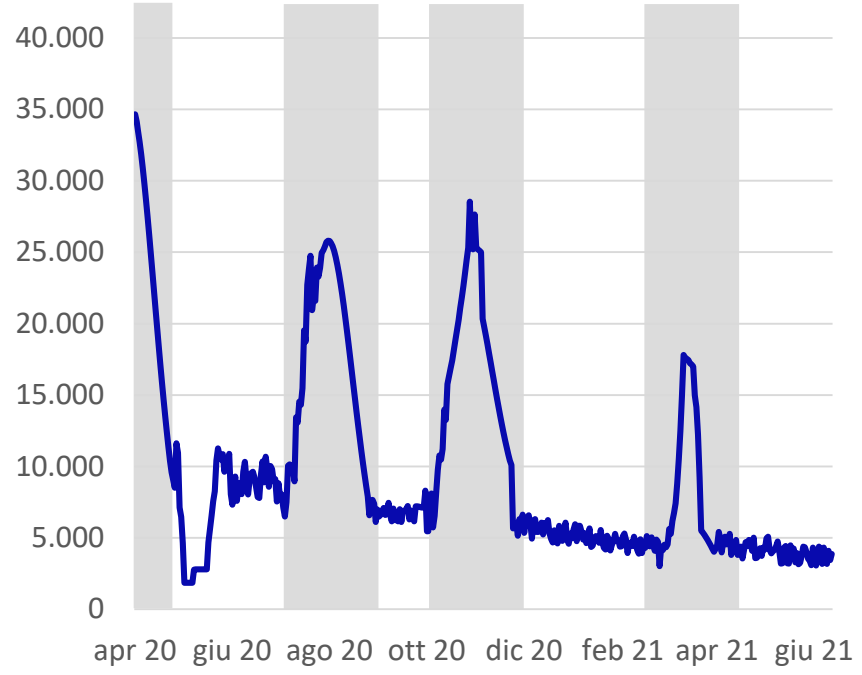
OUR SCENARIO GENERATION AND ANALYIS CAPABILITY COVERS A HOST OF SCENARIOS

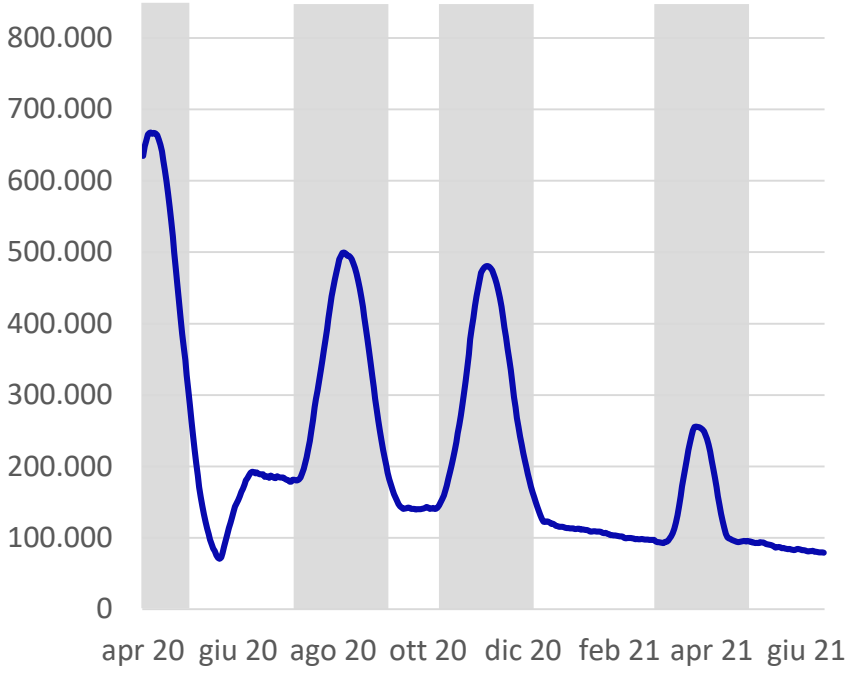
Example Scenario

1. Infection rate managed for a while, but not until the end of summer
2. The second peak is lower
3. No seasonality is experienced
4. Asymptomatic cases contribute to broader immunity
5. Vaccination becomes available July 2021

U.S. – New Cases



U.S. – Active Cases



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OLIVER WYMAN HAS DEVELOPED A FULLY INTEGRATED "ANALYTICAL STACK" WHICH CONNECTS COVID SCENARIOS THROUGH TO ECONOMIC AND BUSINESS IMPACTS

PRIVATE SECTOR

Challenge to macroeconomic views
More granular approach

Decision support tools
Control tower

COVID strategy operational delivery
Models, processes, capacity

PANDEMIC NAVIGATOR

Epidemiology (by country)

Lockdown Patterns

Industry Earnings (by sector)

Fiscal/Monetary Stimulus

Risk/Loss Transmission

Banking/Insurance/Funds/PE

PUBLIC SECTOR

Monitoring key metrics
Understanding the impact of decisions

More targeted policy response
Design-led and data-driven approach

Assessing hospital capacity
Initial use case

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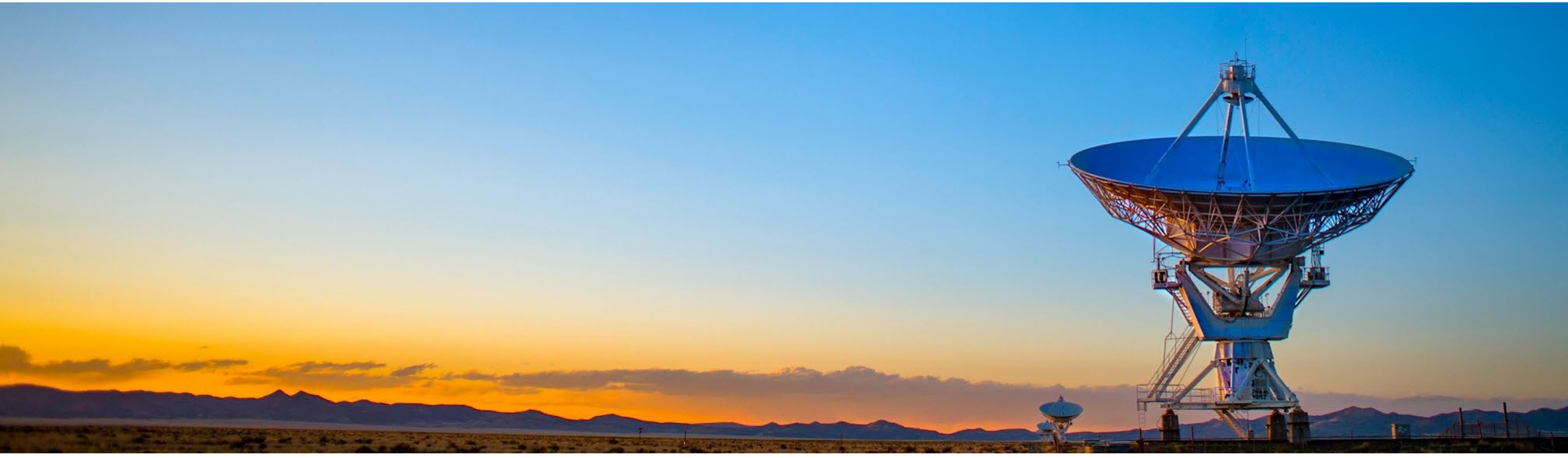
READ OUR LATEST INSIGHTS ABOUT COVID-19 AND ITS GLOBAL IMPACT ONLINE

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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