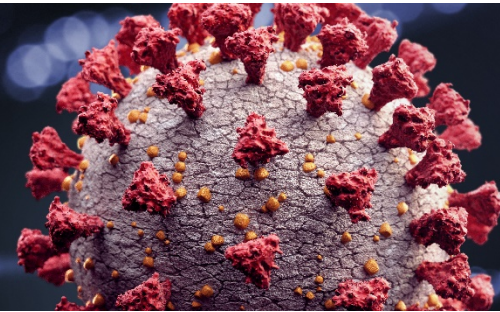
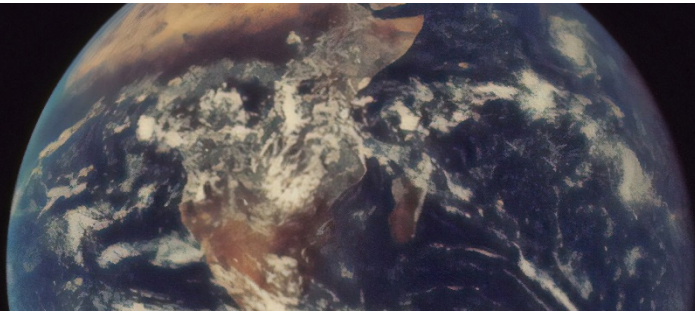


RESPONDING TO COVID-19

Almanac Highlights

June 4, 2020 update

INTRODUCTION: OLIVER WYMAN COVID-19 ALMANAC



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 a sample of available baseline 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

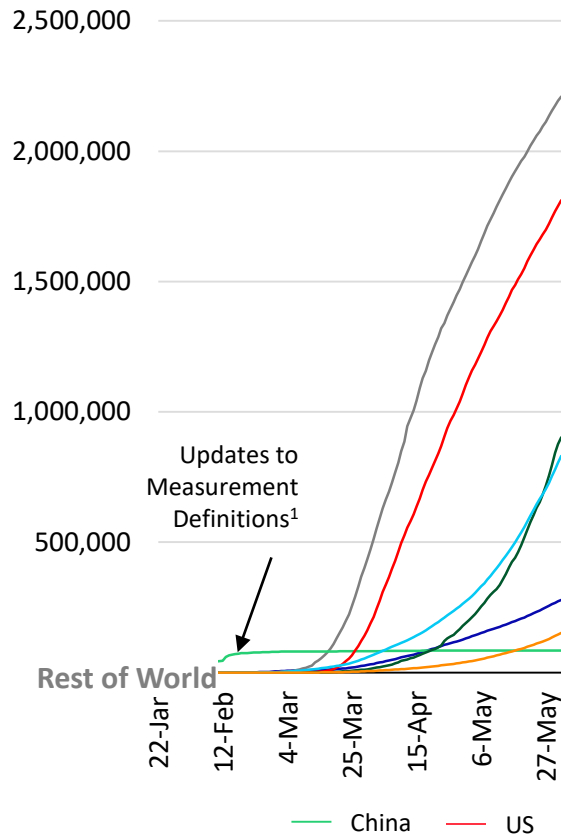
OUR DETAILED ALMANAC CONTAINS THE LATEST PERSPECTIVES ON KEY AREAS RELATED TO THE COVID-19 PANDEMIC

	Key Topics	Summary
Epidemiologic perspectives (Sample pages 4-6)	<ul style="list-style-type: none"> • Epidemiological background • Up-to-date statistics by geography 	<ul style="list-style-type: none"> • Coronavirus, declared a pandemic in March 2020, has infected millions globally • The virus displays unique and deadlier characteristics than other known diseases • The pace and maturity of infection is highly variable by region, largely hinging on speed and strength of government response
First peak suppression and road to re-opening (Sample pages 7-8)	<ul style="list-style-type: none"> • Current state of suppression by geography • Requirements for re-opening with detail on key capabilities 	<ul style="list-style-type: none"> • Many countries have effectively suppressed the first peak through a range of measures, but re-opening and recovery is just beginning • Health system capacity, testing, tracing, surveillance and social distancing are key tools on the road to re-opening
Re-opening considerations (Sample pages 9-11)	<ul style="list-style-type: none"> • Strategic framework for re-opening • Economic considerations 	<ul style="list-style-type: none"> • Government policies, which must balance public health with restoring economic health, will shape the next phases of the pandemic
Lessons learned from re-opening (Sample pages 12-13)	<ul style="list-style-type: none"> • Global lessons learned • US opening approach and risk of disruption • Employer implications 	<ul style="list-style-type: none"> • As countries re-open, we are crystalizing best practices and assessing regions with greatest risk of further disruption
Oliver Wyman Pandemic Navigator (Sample pages 14-18)	<ul style="list-style-type: none"> • Overview • Example capabilities • Web-based version to explore 	<ul style="list-style-type: none"> • Oliver Wyman has developed a unique time-dependent SIR model to forecast the spread of the virus at the state and county level called the Pandemic Navigator Core Model • Along with a number of methodologies and tools, Pandemic Navigator provides business leaders and policymakers with the data needed to make informed decisions through the crisis • A sample of the Pandemic Navigator is available freely online
Vaccines and therapeutics (Sample pages 19-20)	<ul style="list-style-type: none"> • Therapeutics in development • Vaccine development timeline and current state • Key considerations and unknowns 	<ul style="list-style-type: none"> • Effective therapies and an eventual vaccine will be critical to bring economies and communities fully “back to normal” - further testing and drug development is to come, and timelines are long • Constantly evolving understanding of the disease and limited understanding of the immune response to it propagates uncertainty around how and when the pandemic will resolve
Macroeconomic outlook (Sample pages 21-22)	<ul style="list-style-type: none"> • Most recent forecasts of US and global GDP and US unemployment 	<ul style="list-style-type: none"> • Latest GDP forecasts predict a severe shock to the US economy, mirrored by unemployment levels • Return to pre-COVID levels is anticipated early 2022

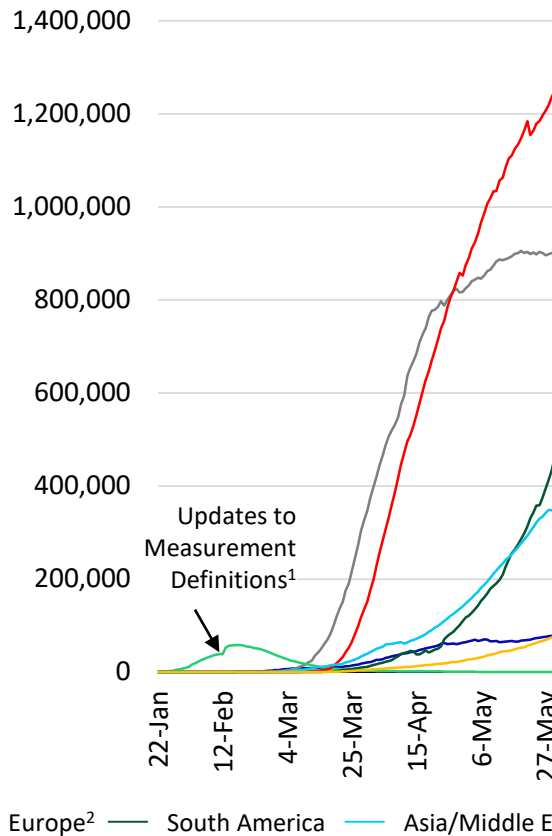
COVID-19 TRENDS AND SPREAD OF THE DISEASE

Cumulative confirmed cases continue to rise across the world, but the epicenter is beginning to shift away from Europe and towards South Asia, the Middle East, and South America

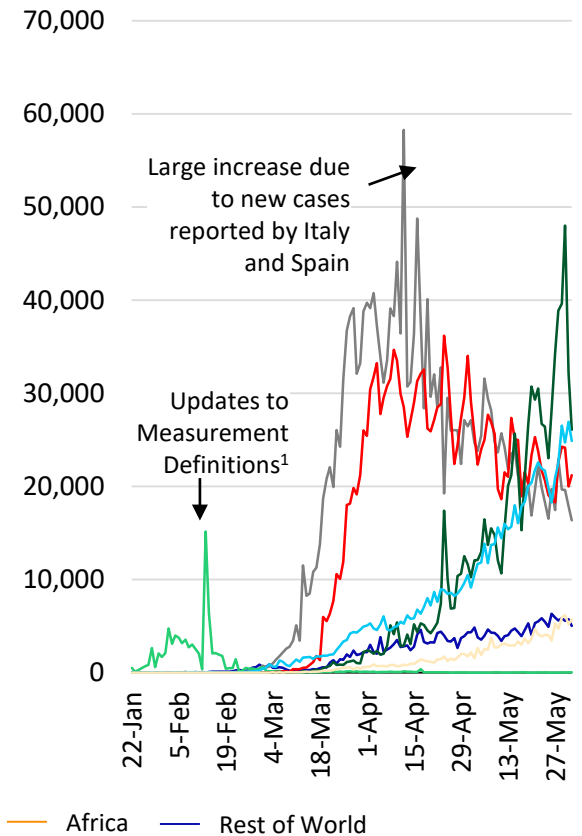
Cumulative Confirmed Cases of COVID-19



Active cases per day of COVID-19



New Cases Per Day of COVID-19



Source: John Hopkins University & Medicine Coronavirus Resource Centre

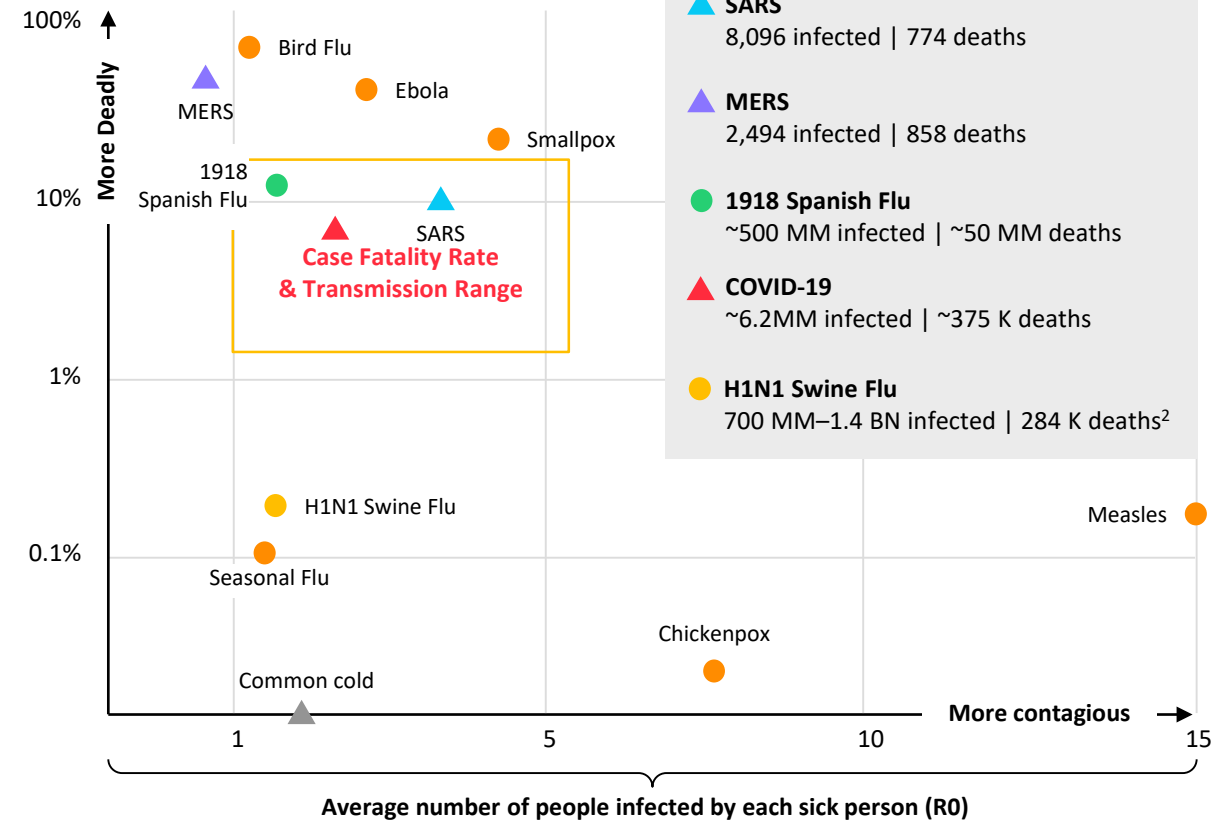
1. Until February 17, the WHO situation reports included only laboratory confirmed cases causing a spike in total cases. Some sources include this update as of February 13. The jump due to inclusion of non lab confirmed cases is not included in the new cases data in WHO situation reports.; 2. Includes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

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

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

Case Fatality Rate¹

Log scale



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. 6. Emerging Infectious Diseases ([link](#)) 7. Science ([link](#))

AT A GLANCE: SUMMARY FACTS

	Key facts	Implications
Contagion	<ul style="list-style-type: none"> 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 others³; R0 for the seasonal flu is around 1.3⁴ New emerging estimates suggest R0 may be closer to 5.7 (edge of range 3.8–8.9)¹⁴ Early evidence suggests COVID-19’s transmission is highly variable, with most infections resulting in no subsequent infections and a few resulting in many, which should color response¹⁷ 	COVID-19 is at least twice as contagious as the seasonal flu
Current human immunity	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> The incubation period is a median of 5.5 days (up to 14 days)^{1, 10}, (vs 3-day period for common flu¹); data suggests that viral shedding continues beyond symptom resolution⁶ 	People are contagious for longer periods than the flu or other illnesses, requiring longer bouts of quarantine to suppress spread
Fatality	<ul style="list-style-type: none"> Case fatality rates are trending at 6.0% globally⁸ (vs. 0.1% for flu)⁹ Estimates for infected fatality rate are 0.3%–1.3% based on assumptions around the number of undiagnosed individuals¹³ 	Fatality is orders of magnitude higher than typical influenzas
Portion of cases asymptomatic but contagious	<ul style="list-style-type: none"> COVID-19 can be spread asymptomatically⁵ 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-19¹¹ 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 asymptomatic¹² 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	<ul style="list-style-type: none"> Approximately 19% of confirmed cases are considered “severe” or “critical”, requiring hospitalization; 1/4th of those need ICU beds⁷ 	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 virologic 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](#)) 17. Science ([link](#))

WHAT DOES IT TAKE TO REOPEN ONCE THE FIRST PEAK IS SUPPRESSED?

Capability¹

Where are we?



1: Health system capacity

The personnel, PPE, beds, and other equipment to sustainably manage normal healthcare needs and a potential new surge

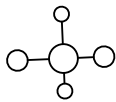
Most countries and US states have sufficient capacity though a few hot spots remain at the margin



2: Testing

Sufficient rapid testing to screen essential workers, conduct random testing, effectively contact trace and ID new flareups

US as a whole and many European countries are making progress on building necessary capacity, some European and Asian Countries (Germany, Norway, S. Korea) and specific US States (CA) have adequate supply



3: Contact tracing

Identification, testing, and isolation of infected individuals' contacts

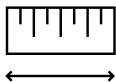
Most countries lack adequate capacity; rapid staff up and creation of technological tools are beginning to fill the gap



4: Central surveillance

Processes and infrastructure for aggregating and 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



5: 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. CDC has issued guidance on these topics that should be referenced by local authorities
© Oliver Wyman

OUR FACTBASE ON KEY CAPABILITIES REQUIRED FOR REOPENING IS CONSTANTLY EVOLVING TO INCORPORATE THE MOST UP TO DATE INFORMATION



Health system capacity

1 | Health system capacity

HEALTH SYSTEM CAPACITY IN THE US

Some states are at the top of health system capacity while others have been

Oliver Wyman 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 elements of capacity are the true rate limiters
 - Staff, particularly nurses and respiratory therapists
 - PPE: A survey of clinicians in CA, FL, IL, TX, MA, PA, NJ, NY, and CT found that all but PA claims less than a week's supply of N95 masks
 - Capacity is inconsistently distributed (e.g. 48% of hospitals have no privileged critical care physicians)

1. Infects reported by address; responses represent exposure to underlying metrics. 2. Oliver Wyman and Public Health PA
© Oliver Wyman

1 | Health system capacity

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

Oliver Wyman COVID-19 projections (select European countries)
Active cases per million

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

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

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

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

France: Lack of testing capacity and initially uncoordinated nursing home cases have complicated capacity planning

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Testing

2 | Testing

TESTING IS A CRITICAL NOW AND AS WE RELAX

Three types of tests have been available

Lab: Samples are collected and sent to a lab for processing

- Molecular: Best for diagnosis
- As of 5/2, received to COVID-19
- On 5/20, rapid tests (PCR)
- LAMP: rapid tests (PCR)

Point of Care (POC): Samples are collected and processed at the testing location (test site, hospital, clinic, etc.)

- As of 5/2, tests (LAMP, Biotech)
- As of 5/2, received to COVID-19
- On 5/20, rapid tests (PCR)
- LAMP: rapid tests (PCR)

At home: Sample collection at home, processing can vary between home and lab, depending on test

- FDA has collected 4,219 POC tests (5/17)
- As of 5/2, received to COVID-19
- On 5/20, rapid tests (PCR)
- LAMP: rapid tests (PCR)

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2 | Testing

HOW DO THE AVAILABLE

Utility

- Provide best current view of current point in time
- Support decision-making: isolation to return to work current point in time
- Current CDC guidelines: negative test just says: currently not contagious to work/stay so

Accuracy

- Tests are believed to be positive test effectively
- Initial estimates suggest (95% false negative rate of the time) (to combat)
- Also require two consecutive tests 24 hours apart
- A study conducted by U.S. suggests that self-administered tests (vs typical nasal swab) are similarly effective to lab
- Accuracy of newly available POC (turnaround times) significantly greater than lab-based tests (vs typical nasal swab)
- Lab-based tests have turnaround times ranging from 1 hour to 24 hours (on lab location and how)
- Commercial testing out (CMT) reimbursing \$30 reimbursement for test
- Newly approved testing

Turnaround time

- Commercial testing out (CMT) reimbursing \$30 reimbursement for test
- Newly approved testing

Cost

- Commercial testing out (CMT) reimbursing \$30 reimbursement for test
- Newly approved testing

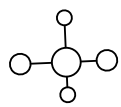
1. Oliver Wyman

2 | Testing

MANY COUNTRIES AND US STATES HAVE EXPANDED TESTING CAPACITY BUT ADDITIONAL CAPACITY IS STILL REQUIRED TO FULLY REOPEN

Tests per thousand people (Data as of 6/1/20)

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Contact tracing

3 | Contact Tracing

EFFECTIVE CONTACT TRACING: THE NECESSITY

Pair manual and tech awareness campaign

- Expand the public or newly captured contacts of infected
- Mix of manual (find contacts) and tech (phone tracking, etc)
- Scaled abilities to e food delivery, isolate treatment for quar
- S. Korea demonstrated the outbreak by encouraging the tested
- Targeted broader individuals to isolate

Workforce

- The US Government tests and related employees decide v
- Some companies a COVID manager
- To care for employees
- To minimize risk, becoming infected
- To improve costs
- 25% of CFOs say their capabilities with the
- Companies are looking relationship management allow tracking of m early in the process

Technology and Processes

- Encouraging the tested
- Targeted broader individuals to isolate

Population Orientation

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3 | Contact Tracing

THE US AND EUROPEAN CONTACT TRACING CAPABILITIES

Private deployment

- The US Government tests and related employees decide v
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Population Orientation

1. Oliver Wyman

3 | Contact Tracing

CONTACT TRACING: WILL TECHNOLOGY SAVE US?

There are a few ways technology can supplement the otherwise highly manual contact tracing process but none are a silver bullet

Is anyone doing this?

- In place in Singapore, and planned for Europe and US through a jointly developed Apple-Google tool with which state/country apps can be built
- Several state governments and private companies are working with existing tech vendors such as Salesforce
- South Korea led the way in combining myriad data from CCTV, cell-data, badge-swipes, payments, etc to track contact between infected and non-infected individuals

How it could save us

- Short cuts the laborious process required to ID contacts
- IDs contacts that would not be revealed in an interview (e.g. stranger on a nearby park bench)
- Can maintain a high degree of privacy if it uses the DP-3T protocol as Apple/Google plan
- Anything that reduces the person-hours and increases the accuracy of contact tracing will increase capacity and make reopening less risky

Why it's complicated

- Requires very high uptake (90%) to be effective - unlikely
- Privacy concerns are likely to continue ("We're using the DP-3T protocol") - unlikely to be widely persuasive
- Does not fundamentally change the time-consuming process
- Privacy concerns are likely to persist
- Massive privacy concerns - questionable that this would be tenable in most Western countries
- Complex from a technological perspective

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Central surveillance

4 | Surveillance

AN EFFECTIVE SURVEILLANCE SYSTEM IS CRITICAL TO EARLY ENOUGH TO MANAGE WITHOUT WHOLESAL

What do we need?

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

When can

- Testing for the US
- Additional data are available
- European systems
- Asian countries
- The US's deployed of hospital for outdoor and red
- CDC's release 5/13
- State/municipal is unclear
- As expert modeling

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4 | Surveillance

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

← Most Invasive →

Case study: China

- 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 contact 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

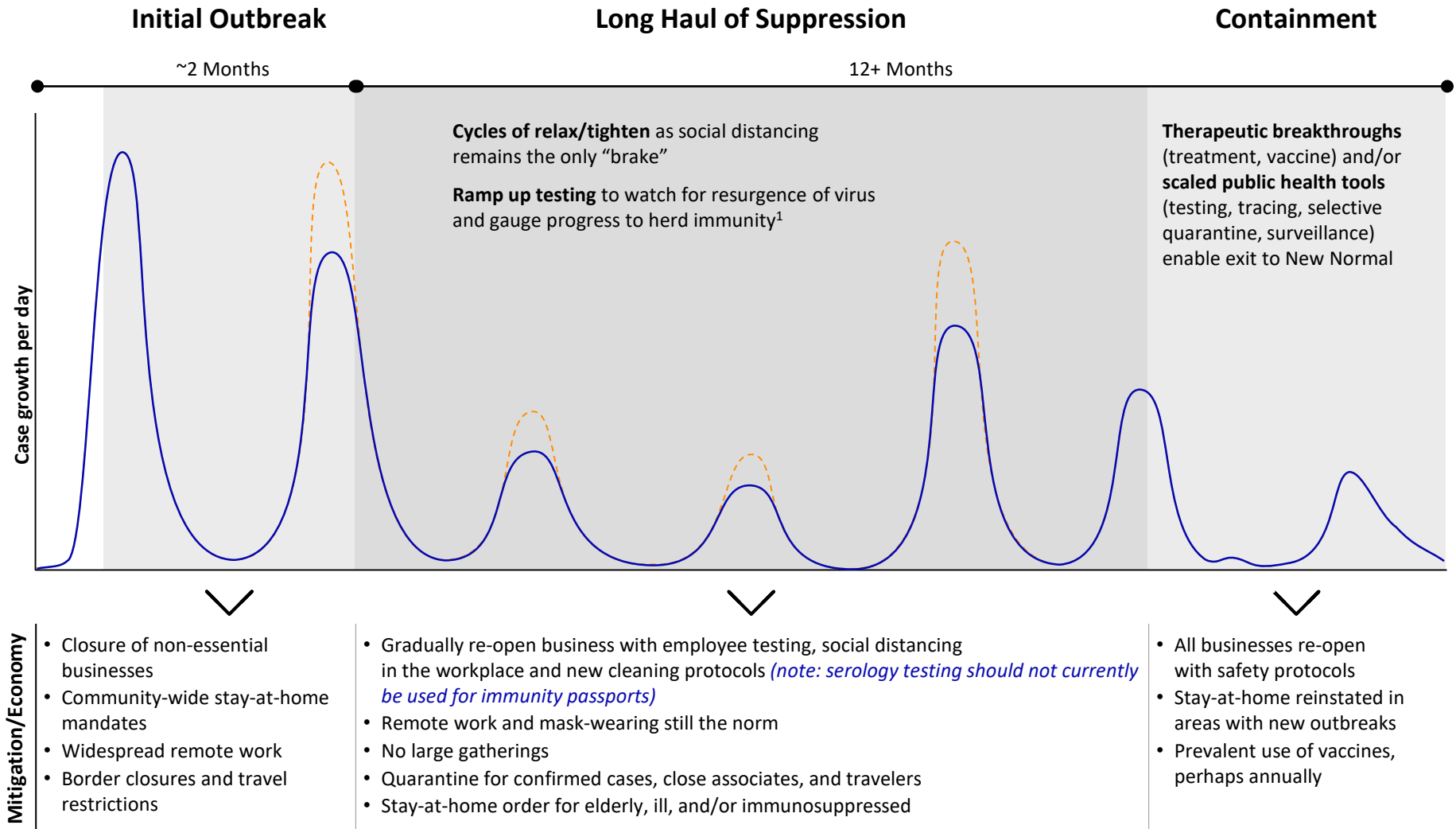
- Tracking
 - Retrieves physical steps of anyone who tested positive
 - Used credit card records, GPS data and security camera footage
 - Mass messaging:
 - Emergency cell phone alerts any time there is a confirmed case in individual's district
 - Apps and websites list detailed timelines of infected 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 files for violations

Case study: Apple & Google

- Apple and Google have developed software with Bluetooth to detect when people come into contact with someone who has tested positive for COVID-19 (rolled out 05/20)
- The software will be incorporated into apps made by public health authorities
- Apple and Google will push the software to people's phones automatically
- To protect anonymity, people will be notified whether they came into contact with someone who has COVID-19 "sometime later", not in real time
- The technologies do not collect any GPS location data and instead relies on Bluetooth to keep track of smartphones that have been near each other
- Apple and Google have emphasized that people will have to opt-in to share their COVID-19 status

1. Oliver Wyman

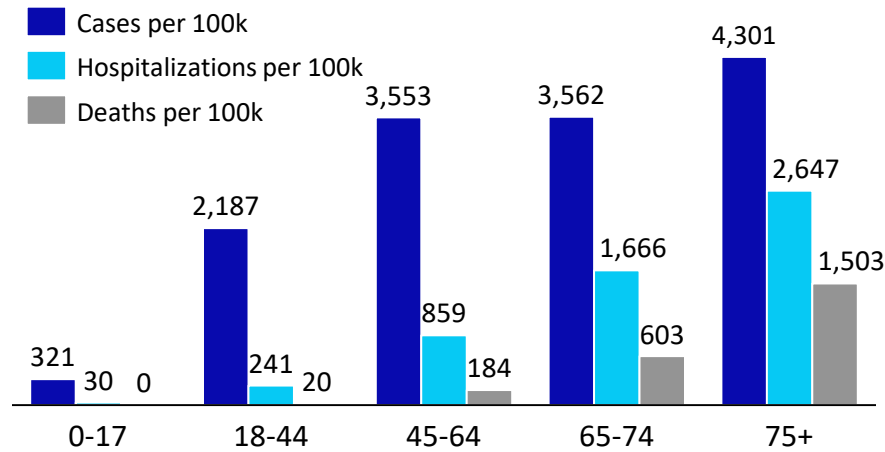
WE CANNOT AFFORD TO REMAIN SHUT DOWN, BUT IT'S NOT WITHOUT RISK TO RE-OPEN FULLY. WE EXPECT >12 MORE MONTHS OF SOCIAL DISTANCING "CYCLES"



REOPENING PLANS SHOULD BALANCE MOBILITY AND ECONOMIC OPPORTUNITY FOR YOUNGER RESIDENTS WITH PROTECTION FOR VULNERABLE POPULATIONS

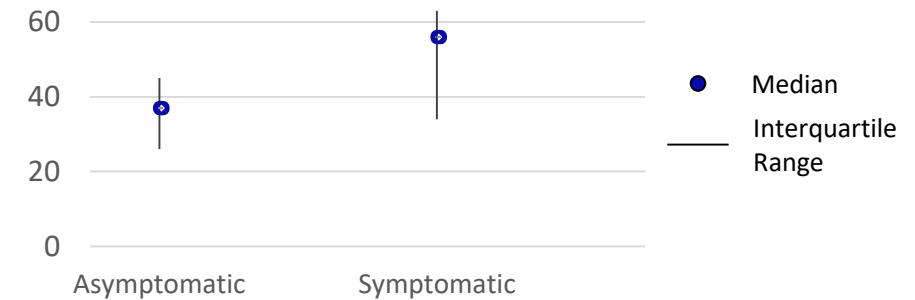
While infection is prevalent in those under the age of 60, the risk for hospitalization and death is severely diminished in younger age groups

Case rates by age
New York City, 2020²



Asymptomatic patients tend to be younger: there is less direct risk to them, but they are more likely to drive unknown community spread

Age distribution of patients, by symptoms
Wuhan, 2020¹



A smart re-opening strategy will allow the less at risk to return to work (safely) to drive economic recovery while carefully protecting the more vulnerable (e.g., elderly, those with co-morbid conditions, residents and workers of long term care facilities)

- Introducing age and health status-differentiated mobility restrictions may reduce infection and fatality risk among the most vulnerable, but governments should have plans in place to ensure those individuals have easy access to supplies and essential items
- Dedicating stocks of tests and PPE to elder care facilities may decrease the risk of outside infection from staffers, as well as allowing for visitation from recently tested friends or family, improving mental health

ILLUSTRATIVE PLAYBOOK COMPONENTS ON WORKFORCE RESILIENCE AND READINESS

Physical work space safety

- Increased ventilation
- Floor layout redesigns and foot traffic guidance to reduce congestion and maintain 6 ft distance
- Comprehensive disinfection practices at appropriate intervals (particularly of high touch surfaces and restrooms)
- Bans on 10+ person meetings
- New behaviors, e.g. masks/gloves at all times in public spaces, frequent hand washing, toilet closure)
- Cafeteria/social space closure
- ...

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
- No sharing of equipment when possible

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
- ...

Health screening/testing

- Temperature checks or assessments at entry
- Testing (on site or protocol for referral to local public health entity/physician)
- Policies related to health screening/testing (e.g. management of medical data and privacy, payment for testing and time required for testing, reporting of results, policy for use of results in deployment of staff)
- Education of management about disease and control measures

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

- Expanded communications, e.g. educational campaign on social responsibility
- Managing workforce concerns about returning to work
- Transportation burden assistance (e.g. to avoid subway use)
- Mental wellbeing coaching resources
- Productivity training for remote collaboration
- Policy & technology provision for extended work-from-home for large portions of workforce
- Child care assistance
- ...

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)
- ...

Legal and labor agreements

- Managing responsibilities to labor unions with regards to lay offs, reduced work hours, testing, etc.
- Appropriate compliance with wage and hour laws, anti-discrimination laws, health and safety laws, the Americans with Disabilities Act, various new (and old) paid sick and family leave rules, etc.
- Preparation for any potential claims filed by employees as a result of measures undertaken during crisis period
- ...

AS US STATES RE-OPEN, WE ARE MONITORING A BROAD ARRAY OF DATA POINTS TO PREDICT REGIONS AT HIGHEST RISK OF ADDITIONAL DISRUPTION

1

Initial peak experience

- How hard has the region been hit?
- Where is the region on its first outbreak curve (emerging, stabilizing, recovering)?
- How well have hospitals been able to manage the first surge?

2

Reopening policy

- How broadly and how quickly are businesses being allowed to re-open?
- How stringent are PPE and social distancing requirements?

3

Public health infrastructure

- Is there sufficient testing capacity to detect patients early?
- Is there sufficient contact tracing capability to identify potential infections early?
- What increased capacity is being planned?

4

Leading indicators

- How are mobility and social distancing indicators changing?
- How is transmission rate increasing?
- Using OW's boots-on-the-ground Global Sensing Network, how are individuals and businesses behaving and complying?

5

Population dynamics

- Is the region higher-risk due to age, population density, comorbid conditions, socioeconomic factors?
- Is there a cultural bias toward social distancing, or multi-gen households?

New cases trajectory
Case fatality rate
Cases per capita
Impact on hospitals, PPE, vents, workforce

Reopening timing, policy, stringency, seq.
PPE/distancing mandate
Travel restrictions

Testing % positive
Tests per day
Contact tracing
Surveillance

Mobility indices (Apple, Google, etc.)
PPE compliance
OW transmission rate
Anecdotal compliance

Age, density, % urban
Chronic conditions
% essential, % WFH
Household size, x-gen
Travel exposure

OUR COVID-19 PANDEMIC DATABASE, ARCHETYPE FRAMEWORK AND DETAILED STATE PROFILES PROVIDE AN UP-TO-DATE VIEW OF EVOLVING RISK

OW's pandemic database compiles key Covid-19 information at a country, state, MSA, and county level

Database: Rapid export and visualization of 50+ metrics across several market dimensions

OLIVER WYMAN COVID-19 PANDEMIC DATABASE

Cases last updated from JHU: 2020-05-17 [UTC]
 Cases last updated for CN from JHU: 2020-02-23 [UTC]
 Latest data pull: 2020-05-19 01:06:16 [UTC]

Export data | Reference table | Graph builder

Date range: 02/01/2020 → 05/19/2020 Aggregate metrics for selected counties **Build CSV**

Country level: Select or search for a nation

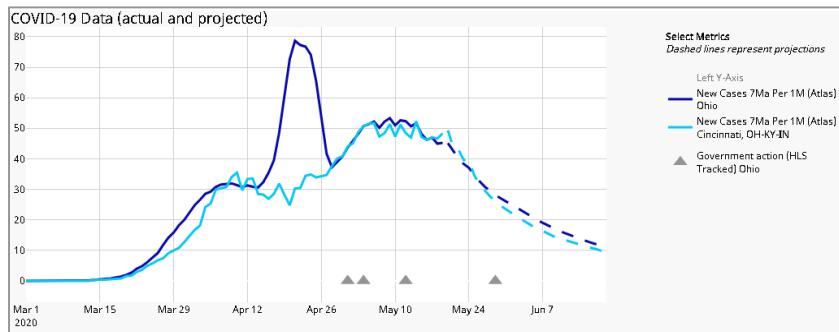
State or province level (US & CA Only): Ohio

MSA (custom geos for atlas data, also included, e.g. NYC 5 Boroughs): Columbus, OH | Cleveland-Dlyne, OH

County level (US Only): Select or search for a county

Static Demographic Statistics: Population, Density Sqkm, Median Age, Urban Population %, Household Size, % Wearing Fm (3/26 - 4/29), % Public Trans To Work, % With Med-Surg Beds, Med-Surg Bed Utilization Rate, Icu Beds, Icu Bed Utilization, Health Risk Index, Obesity %, Diabetes %, Hypertension %, Lung Disease %, Heart Disease %

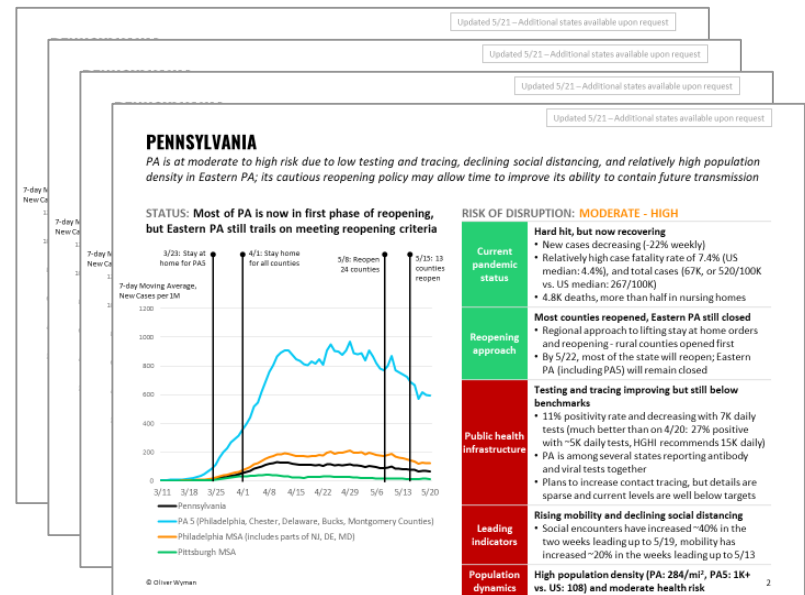
Time Series Metrics: New Cases 7Ma Per 1M [Atlas], New Percent Positive Tests 7MA [Covid Tracking - State]



State Archetypes: OW continuously updates archetype view to identify areas with greatest risk

- Current pandemic status
- Reopening policy
- Public health infrastructure
- Leading indicators
- Population dynamics

State profiles: Detailed profiles double click on key issues facing states and MSAs

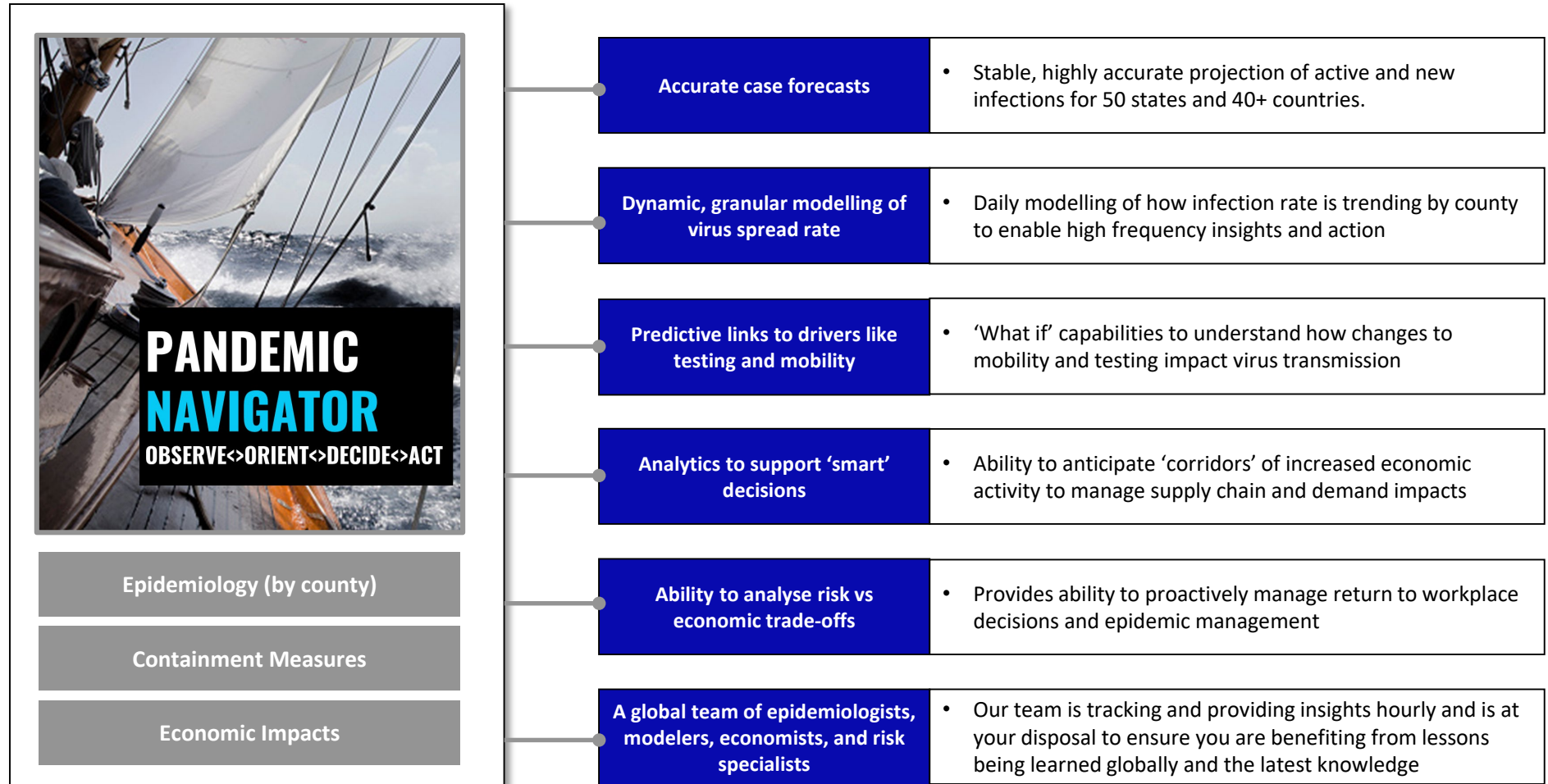


Profiles available upon request

WE HAVE A HIGHLY DEVELOPED TOOLKIT TO SUPPORT MANAGEMENT TEAMS AS THEY NAVIGATE THE CRISIS

We have developed a sophisticated capability which we call the **Pandemic Navigator**...

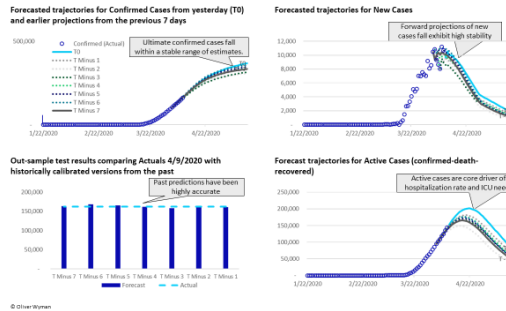
... to provide business leaders with the tools and support they need to chart a course through the next 18 months



OUR PANDEMIC NAVIGATOR ANALYTICS PROVIDE ACTIONABLE INSIGHTS TO EXECS

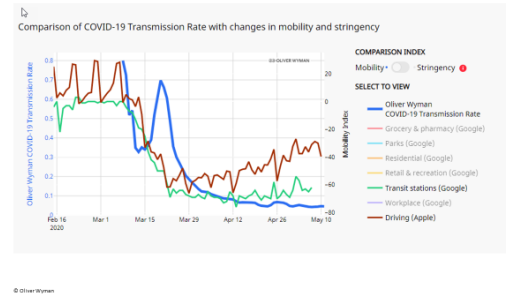
Accurate case projections: US counties, 50 states, 45+ countries

1. Time and size of the peak
OUR MODELS HAVE BEEN GENERATING STABLE AND ACCURATE RESULTS. WE TRACK STATISTICAL TESTS EVERY DAY - RESULTS FOR NEW YORK STATE 4/10/2020



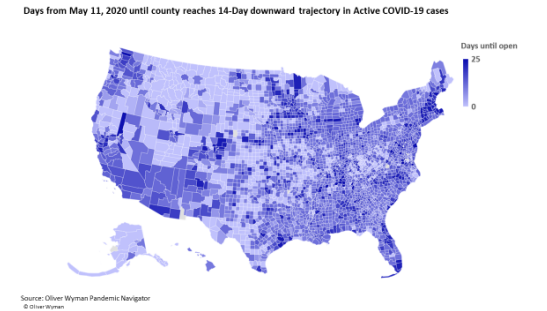
Daily virus infection rates linked to real-time human mobility indices (e.g. Google, Apple)

2. Maximising lead time
WE HAVE LINKED OUR TRANSMISSION RATE MODEL TO INDEPENDENT, OBSERVABLE METRICS FOR HUMAN INTERACTION : GOOGLE'S MOBILITY INDICES NEW YORK



Detailed local projections to inform re-opening and future lockdown risks

2. Maximising lead time
WE ARE NOW MOVING FROM COUNTRY-WIDE BLUNT LOCKDOWNS TO MORE LOCAL MANAGEMENT – OUR OUTPUTS ENABLE FORESIGHT AT A GRANULAR LEVEL



Specific, detailed re-opening policies for high-priority locations – New York example

2. Maximising lead time
WE ARE CALIBRATING PREDICTIVE ANALYTICS TO STATE-LEVEL REOPENING MEASURES NEW YORK EXAMPLE

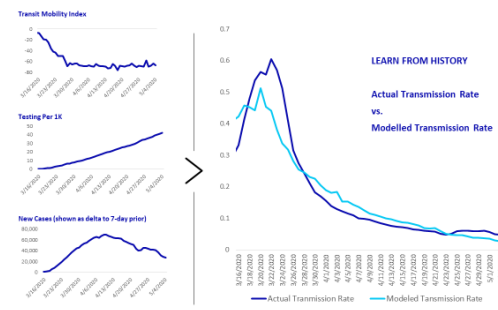
'Moving New York Forward' - Plan divides state into 10 zones with seven target metrics for each

	14 Day Downward Trajectory in Active COVID-19 Cases	14 Day Downward Trajectory in Daily New Cases	14 Day Downward Trajectory in Daily New Deaths	14 Day Downward Trajectory in Daily New Hospitalizations	14 Day Downward Trajectory in Daily New ICU Occupancy	14 Day Downward Trajectory in Daily New Cases	14 Day Downward Trajectory in Daily New Deaths	14 Day Downward Trajectory in Daily New Hospitalizations	14 Day Downward Trajectory in Daily New ICU Occupancy	14 Day Downward Trajectory in Daily New Cases	14 Day Downward Trajectory in Daily New Deaths	14 Day Downward Trajectory in Daily New Hospitalizations	14 Day Downward Trajectory in Daily New ICU Occupancy
Capital Region	NO	YES	0.58	41%	44%	NO	325	477					
Central New York	YES	YES	0.47	49%	51%	NO	233	372					
Finger Lakes	YES	YES	1.19	52%	64%	NO	361	577					
Long Island	YES	NO	5.29	65%	20%	YES	852	277					
Mid-Hudson	YES	NO	4.74	31%	35%	YES	697	477					
Midwest Valley	YES	YES	1.17	58%	64%	NO	146	377					
New York City	YES	YES	5.41	26%	21%	YES	2520	387					
North Country	YES	YES	0.10	53%	64%	NO	126	377					
Southern Tier	YES	YES	0.11	58%	52%	NO	190	377					
Western New York	NO	YES	2.20	46%	40%	NO	414	377					

- | | | | |
|--|--|--|---|
| Phase 1 | Phase 2 | Phase 3 | Phase 4 |
| <ul style="list-style-type: none"> Construction Wholesale supply chain Select retail using curbside pickup only | <ul style="list-style-type: none"> Professional services Finance and insurance Retail Administrative support Real estate and rental leasing | <ul style="list-style-type: none"> Restaurants & food service Hotels & accommodation | <ul style="list-style-type: none"> Arts, entertainment and recreation Education |

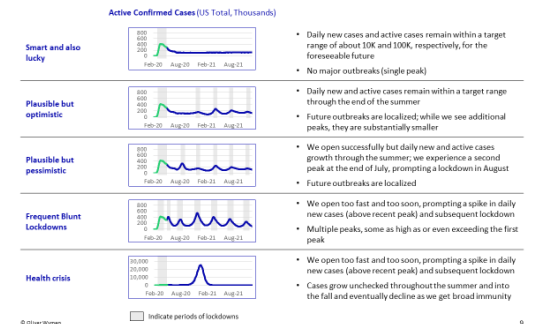
Predictive analytics linked to testing volumes and lockdown policy changes

3. Policy and threat response
WE HAVE DEVELOPED A CAUSAL FORWARD TRANSMISSION RATE MODEL CALIBRATION FOR NEW YORK – UPDATED EVERY DAY



"End-to-end" scenarios to support planning and forecasting applications

WE HAVE FIVE "END-TO-END" SCENARIOS TO SUPPORT PLANNING AND FORECASTING APPLICATIONS, WITH THE ABILITY TO CREATE ADDITIONAL TAILORED SCENARIOS



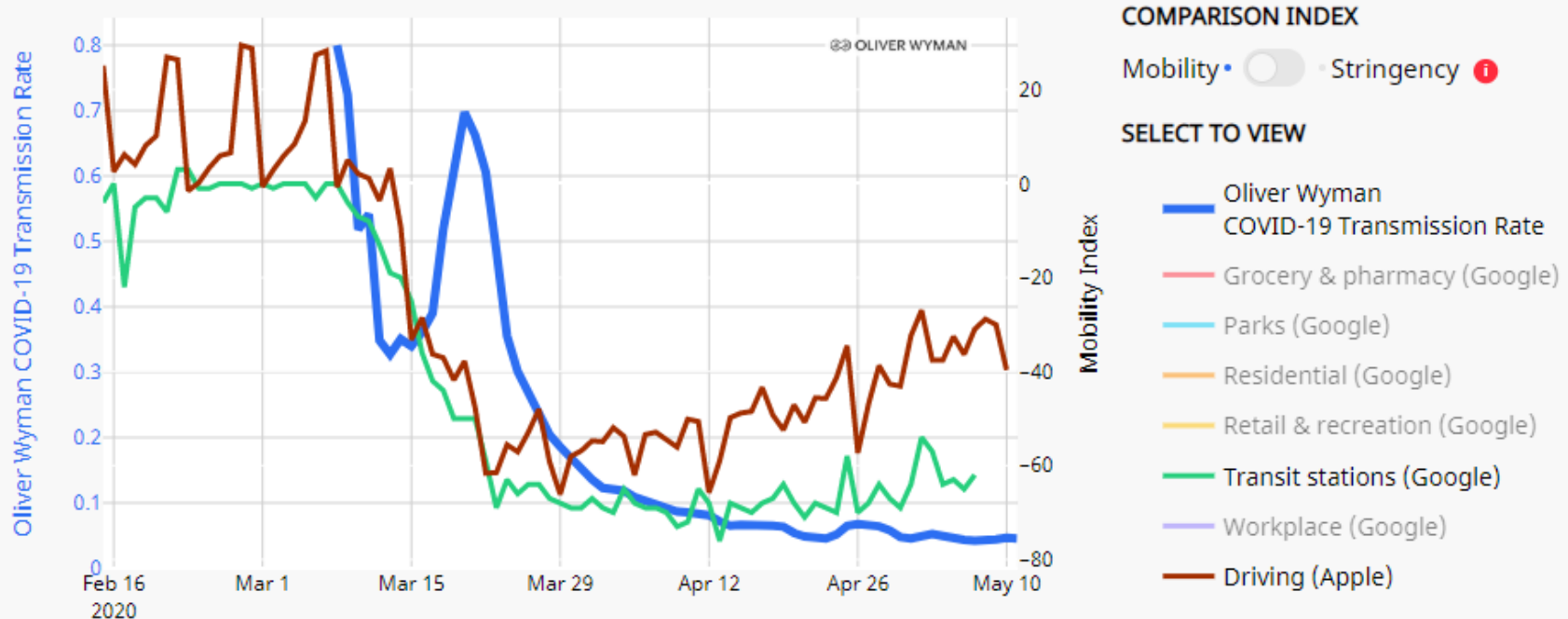
Explore a selection of these capabilities on our website <https://pandemicnavigator.oliverwyman.com/>

OUR TRANSMISSION RATE MODEL IS LINKED TO INDEPENDENT, OBSERVABLE METRICS FOR HUMAN INTERACTION: GOOGLE'S MOBILITY INDICES

Example outputs for New York

Similar outputs are available for all U.S. States

Comparison of COVID-19 Transmission Rate with changes in mobility and stringency



Explore this view and more on our website <https://pandemicnavigator.oliverwyman.com/>

WE CAN ALSO ASSESS THE IMPACT OF HOW CHANGES IN MOBILITY AND TESTING IMPACT VIRUS SPREAD

Example outputs for United States

Similar outputs are available for all U.S. States

Select how mobility and testing changes...

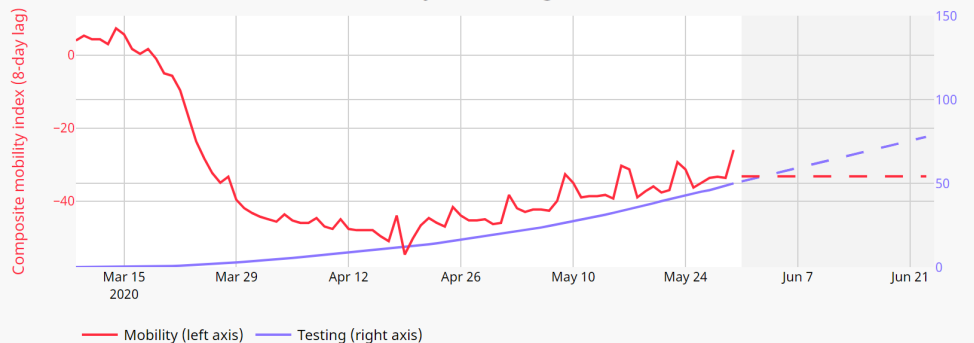
...and see how virus spread evolves

Selections

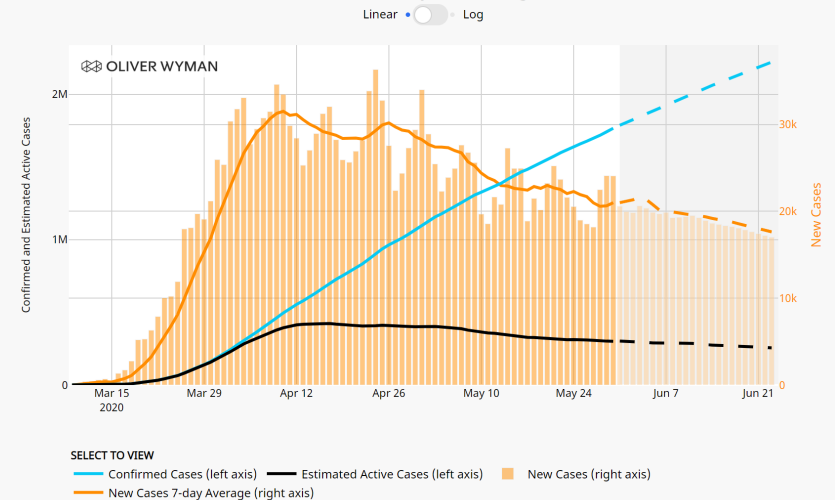
MOBILITY ? No change Increase | TESTING ? Growth at same rate Growth slows by half

REGION: United States

Mobility and testing scenarios

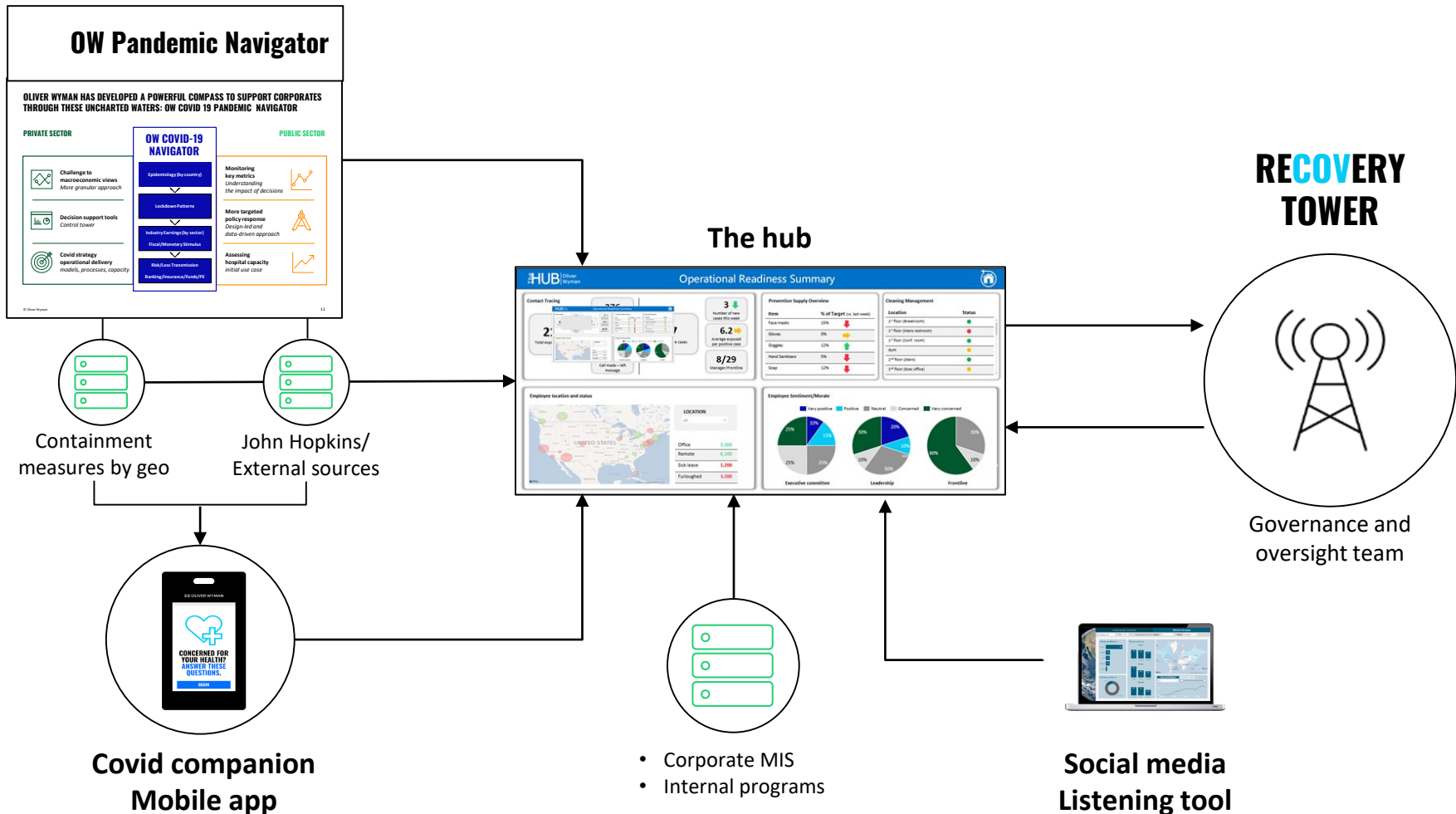


Causal Model: COVID-19 Cases under selected mobility and testing scenarios



Explore this view and more on our website <https://pandemicnavigator.oliverwyman.com/>

LEVERAGING PANDEMIC NAVIGATOR OUTPUT, WE HAVE IMPLEMENTED A RECOVERY INFORMATION SYSTEM THAT INTEGRATES WITH CORPORATE MIS AND ENABLES EFFECTIVE DECISION MAKING DURING THE LONG HAUL OF SUPPRESSION

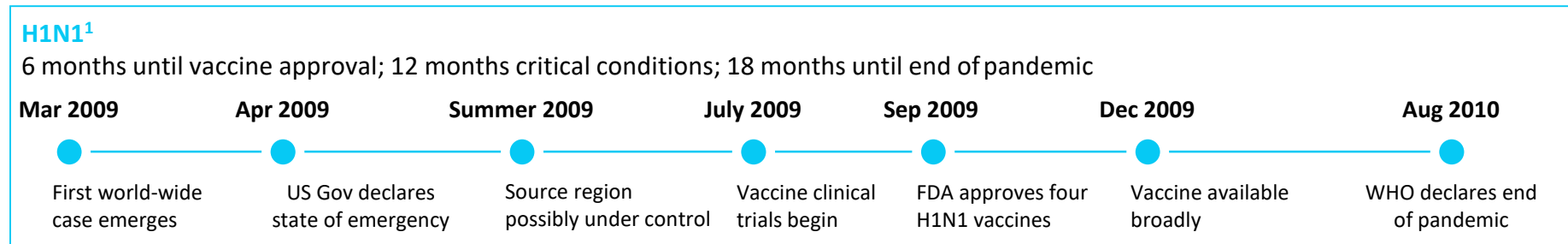


HOW AND WHEN WILL WE RECOVER COMPLETELY?

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:



What is the current status?

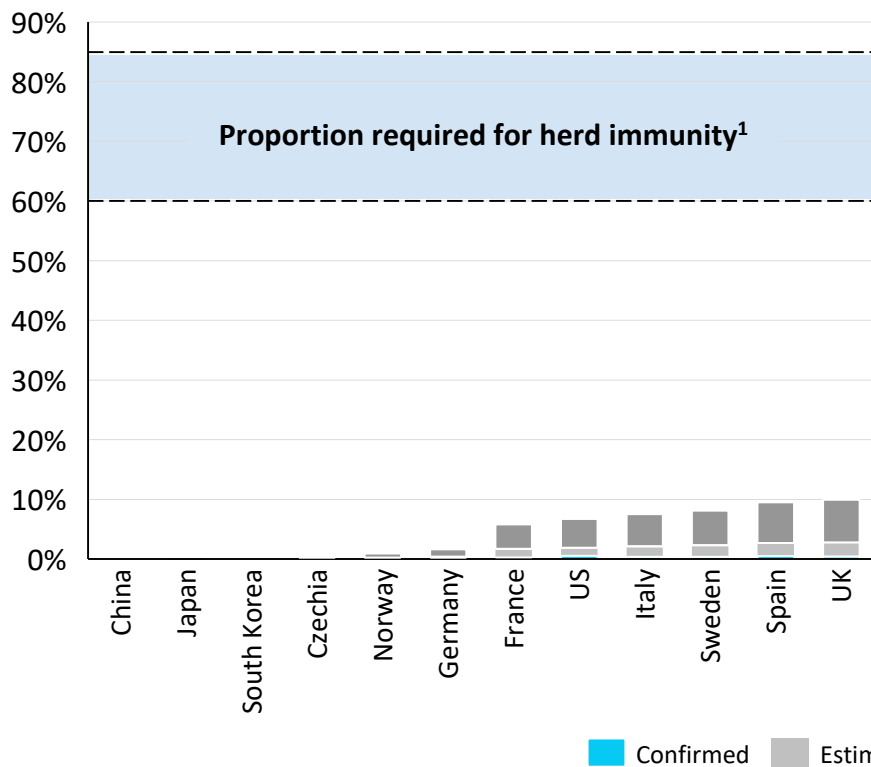
- As of 5/26, there are 113 vaccine programs, with 15 in a clinical stage
- Two broad categories of vaccine are under development:
 - **Traditional, protein-based:**
 - Inactivated vaccine or proteins from it are grown in animal cells and then injected into the human body
 - Category has been proven to work and will rely on existing infrastructure, however will take longer to develop
 - Efforts of note: Partnership between GSK and Sanofi, Novanax
 - Potential timeline – Phase I trials to start later this year, vaccine wouldn't be approved and available until 2021
 - **Modern, nucleotide-based:**
 - mRNA, DNA or inactivated virus is injected into the human body, so that its cells can make viral proteins
 - Category has not been proven, but has a much more rapid timeline to development
 - Efforts of note: Moderna, Pfizer, AstraZeneca – J&J – Oxford University partnership, Inovio
 - Potential timeline – Phase II and III trials have started or planned to start by summer with limited availability of doses potentially available this fall for high risk individuals and frontline workers

Sources: H1N1 timeline ([link](#)), Credit Suisse Equity Research, Nature ([link](#)), Artis Ventures ([link](#)), Biocentury ([link](#)) and DowJones

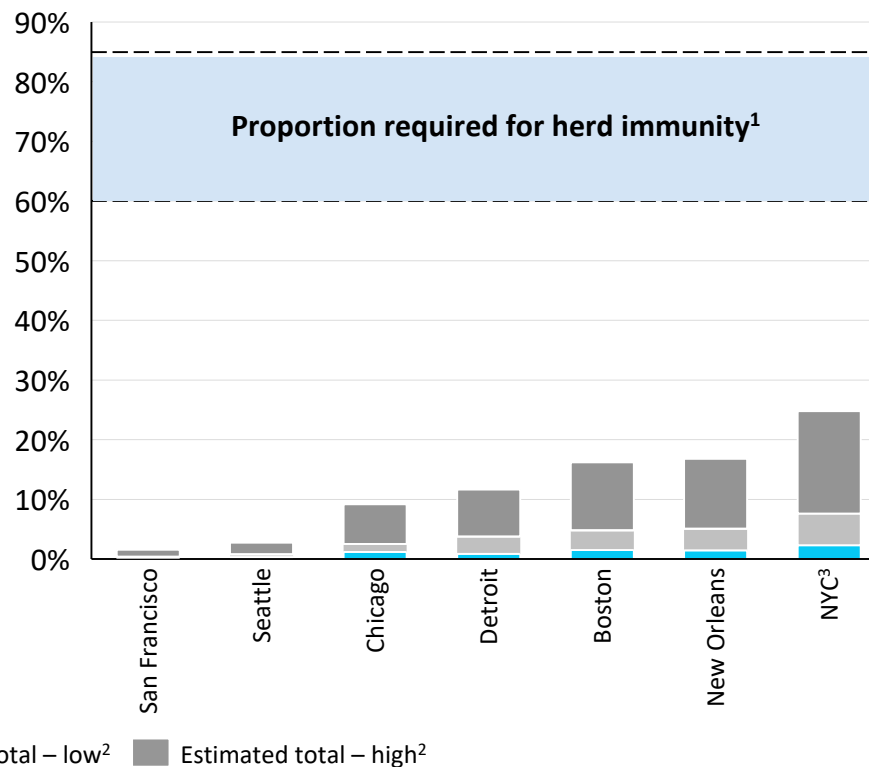
WHAT ABOUT HERD IMMUNITY – CAN THAT HELP?

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



	CN	JP	SK	CZ	NO	DE	FR	US	IT	SE	ES	UK
Deaths per 1M ⁴	3	7	5	29	43	100	440	320	550	430	580	570
Total Deaths ⁴	5K	900	270	320	240	9K	29K	104K	33K	4K	27K	39K

	San Fran	Seattle	Chicago	Detroit	Boston	NOLA	NYC
Deaths per 1M ⁴	60	200	540	1,000	990	960	1,880
Total Deaths ⁴	270	790	5K	4K	5K	5K	36K

Sources: Total confirmed cases by country as reported by Johns Hopkins University as of 5/21/2020; total confirmed cases by US county as reported by US facts as of 5/21/2020; world population as reported by [link](#); total population for MSAs as reported by Claritas.

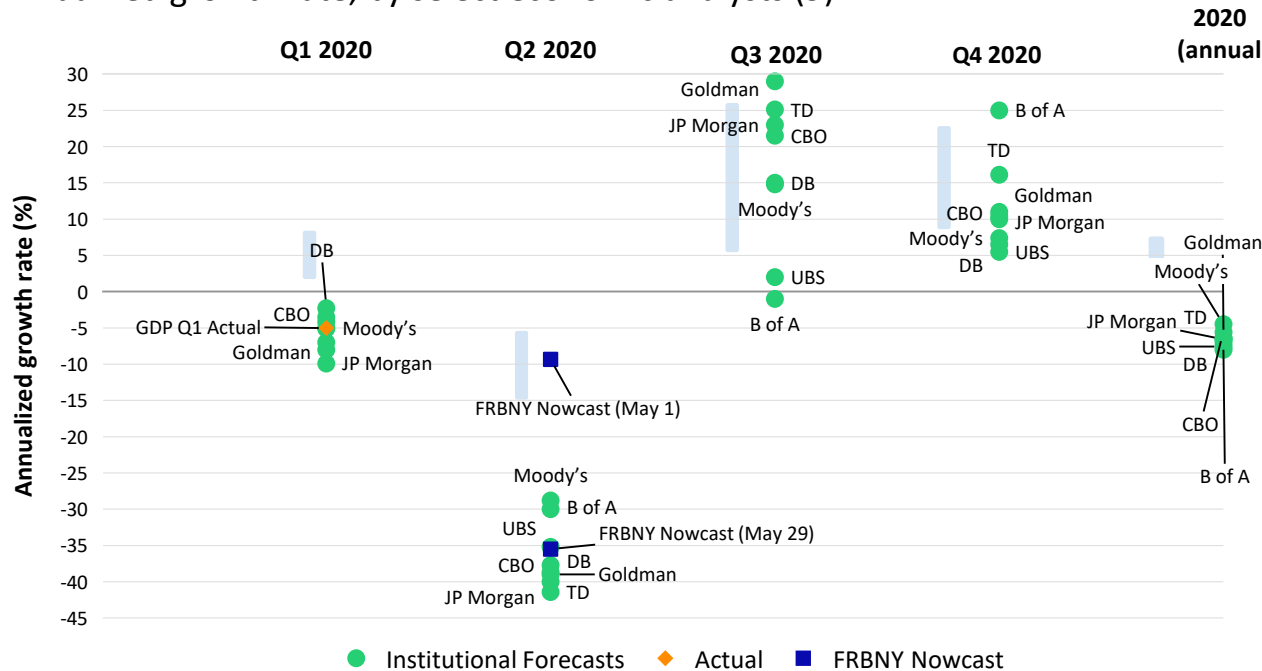
1. Estimates for herd immunity for COVID based on R0 of 2–5.7 and a target of R0<1 ([link](#)) and ([link](#)) 2. Estimated total infected based on Oliver Wyman Pandemic Navigator Model 3. NYC includes 5 boroughs only, not full MSA 4. Oliver Wyman Pandemic Database⁴

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

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

U.S. Real GDP Growth Forecasts – Q1, Q2, Q3, Q4, and annual

Annualized growth rate, by select economic analysts (9)^{1,2}



Key observations from estimates

- Forecast updates have been frequent and sizable – 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 (~30–40% drop) will be the worst since we have quarterly data available
- Key indicators to track include:
 - Trend for percent of U.S. population infected (scenarios ranging up to 80%)³
 - Reliance on “smart” mitigation strategies (e.g., mass testing, use of analytics)

	Q1 2020	Q2 2020	Q3 2020	Q4 2020	2020 (annual)
Median	-3.9%	-38.2%	18.3%	10.2%	-6.6%
Average	-5.2%	-36.4%	16.2%	11.5%	-6.5%
Max/Min	-2.3%/-9.9%	-28.8%/-41.4%	29.0%/-1.0%	25.0%/5.5%	-4.5%/-8.0%
Actuals	-5.0%				

1. Sources: Bank of America (May 15), Moody's (May 15), UBS (May 15), Goldman Sachs (May 12), TD (May 15), JP Morgan (May 29), CBO (May 19), Deutsche Bank (May 15), FRBNY Nowcast (May 1, May 29, Nowcast not included in table calculations), Q1 estimates based on latest forecast before release of Q1 GDP Actual

2. Quarterly estimates in terms of qoq seasonally adjusted annual rate (saar)

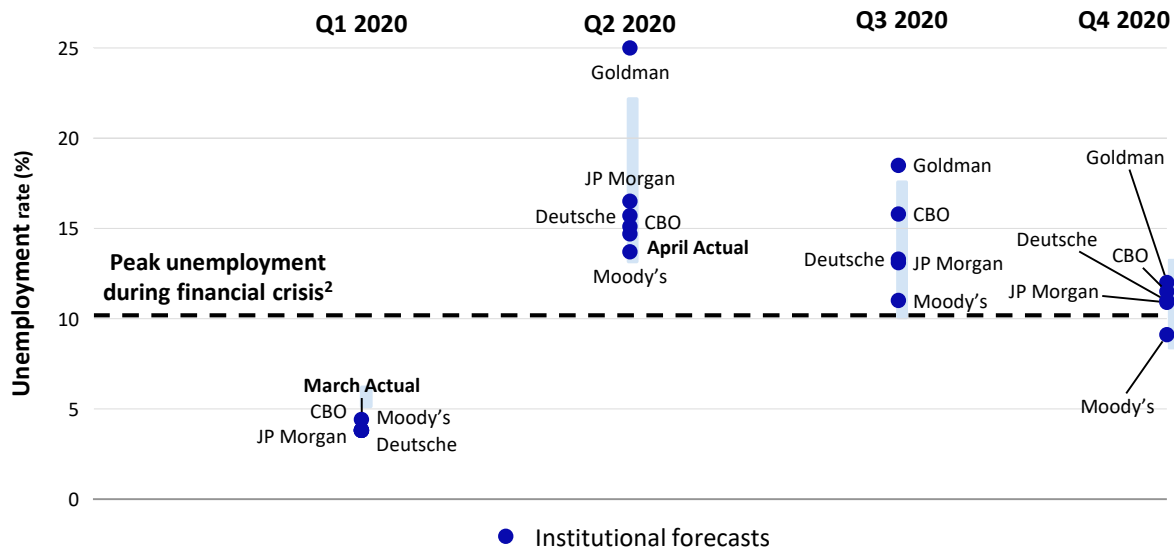
3. Imperial College COVID-19 response team

THE DOWNWARD SHOCK TO GDP IS MIRRORED IN UNEMPLOYMENT

The escalation of the Covid-19 crisis has led to significant bearish revisions unemployment forecasts globally

U.S. Unemployment Forecasts – Q1, Q2, Q3, and Q4

Quarterly unemployment rate, by select economic analysts (5)¹



	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Median	3.8%	15.5%	13.3%	11.0%
Average	3.8%	16.7%	13.6%	10.7%
Min/Max	3.8%/3.8%	13.7%/25.0%	9.1%/18.5%	7.1%/14.0%
Actuals²	4.4% (Mar)	14.7% (Apr)		

Key insights

- Most annual unemployment forecasts assume a steady economic recovery starting in June, and do not account for the possibility of subsequent significant waves of infection
- 41.1 million unemployment claims filed since start of the COVID-19 lockdown, wiping out the last eleven years of job gains^{2, 3}
- Congressional Budget Office forecasts a slower employment recovery than most major banks
- The CARES Act has allocated ~\$660B in forgivable loans to cover small business payroll expenses, padding against additional job losses in the short term

1. Sources: 1. Sources: Bank of America (May 15), Moody's (May 15), UBS (May 15), Goldman Sachs (May 12), TD (May 15), JP Morgan (May 29), CBO (May 19), Deutsche Bank (May 15), FRBNY Nowcast (May 1, May 29)

2. Sources: U.S. Bureau of Labour Statistics

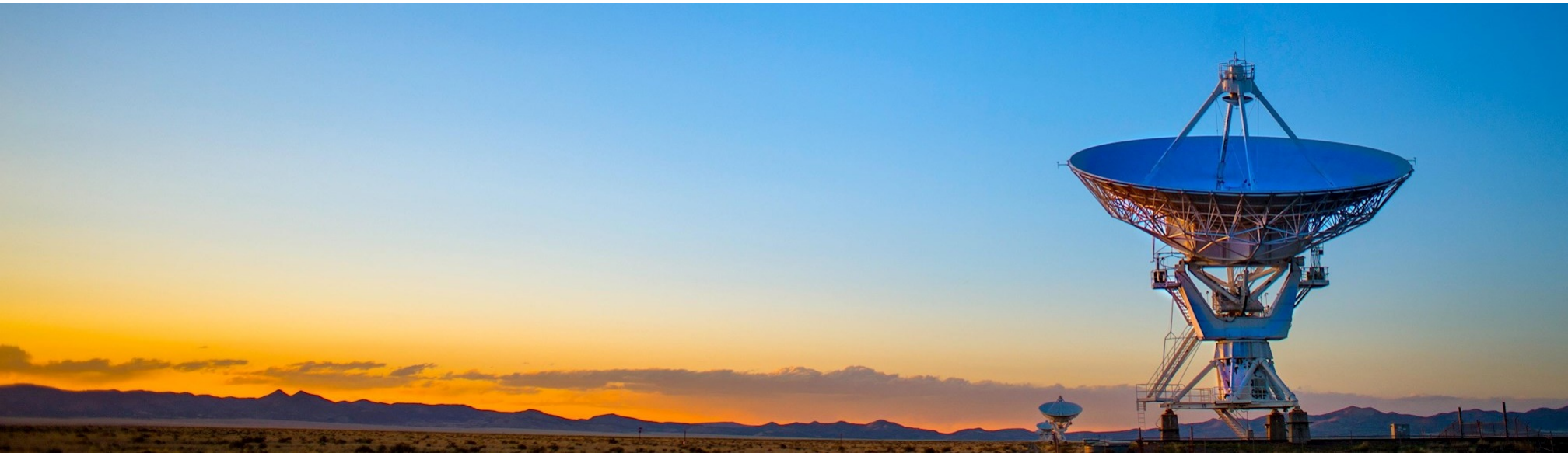
3. Tracking unemployment forecasts against unemployment reports may be misleading – unemployment reports only record jobless workers actively searching for employment

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

Oliver Wyman and our parent company Marsh and 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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