## **OLIVER WYMAN**

# WEBINAR: COVID-19

#### Epidemiology, Scenarios, and Implications

May 8, 2020

Please note that this session was held at a particular point in time (Friday May 8th, 10:15 am – 11 am EDT), and in light of the rapidly evolving Covid-19 situation, it is possible these discussions are no longer accurate after that date.

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#### **INTRODUCTIONS**



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#### **WEBINAR AGENDA**

01	Epidemiologic Perspectives & implications	
03	OW Pandemic Navigator and Scenario Planning	15 min
06	Additional Q&A	Remaining time

# **01** EPIDEMIOLOGY

### **COVID-19 SPREAD GLOBALLY**

#### As of May 11th, 2020

- >4.1M cases reported in 185 countries and territories
- ~284 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)

## 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



#### Additional details

- R-naught (R0) represents the number of cases an infected person will cause
  - 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<sup>3</sup>; R0 for the seasonal flu is around 1.3<sup>4</sup>
  - New emerging estimates suggest R0 may be closer to 5.7 (edge of range 3.8-8.9)<sup>6</sup>
- The global case fatality rate for confirmed COVID-19 cases is currently 7.1%<sup>5</sup> according to WHO's reported statistics versus 0.1% for the seasonal flu; the rate varies significantly by country (e.g., Italy – 13.9%, South Korea – 2.4%<sup>5</sup>)
- We expect case fatality rates to fluctuate as testing expands identifying more cases and as existing cases are resolved

#### Denotes Coronaviruses

1. New York Times (<u>link</u>) for fatality and R-naught comparisons, CDC timelines for case numbers (selected link: CDC <u>SARS</u> timeline); 2. Updated CDC estimates (<u>link</u>); 3. The R0 for the coronavirus was estimated by the WHO to be between 1.4 - 2.5 (end of January estimate) (<u>link</u>), other organizations have estimated an R0 ranging between 2-3 or higher (<u>link</u>); 4. CDC Paper (<u>link</u>); 5. Calculated as Number of Deaths / Total Confirmed Cases as reported by John Hopkins University. 6. Emerging Infectious Diseases (<u>link</u>)

## **COVID-19 TRENDS AND SPREAD OF THE DISEASE**

Cumulative confirmed cases continue to rise across the world, but new cases per day have begun to taper in key epicenters (China, Europe, US)



#### Active 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

## MOST COUNTRIES IN ASIA AND EUROPE ALONG WITH THE US HAVE MANAGED TO FLATTEN THE CURVE AND ARE NO LONGER SEEING EXPONENTIAL GROWTH



#### Days since 100<sup>th</sup> confirmed COVID-19 case

Sources: JCSSE (Johns Hopkins), local news and county health departments, as of 3/17. Pre-WHO China data from NHC) Containment sources: China, S. Korea, US and testing stats, Italy 100<sup>th</sup> 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 5/8/2020.

### **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<sup>1</sup>



#### 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 preexisting 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 60% of cases outside of China are still active

1. Calculated as Number of Deaths/Total Confirmed Cases as reported by Johns Hopkins University

### AT A GLANCE: SUMMARY FACTS

	Key facts	Implications
Contagion	<ul> <li>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<sup>3</sup>; R0 for the seasonal flu is around 1.3<sup>4</sup></li> <li>New emerging estimates suggest R0 may be closer to 5.7 (edge of range 3.8-8.9)<sup>14</sup></li> </ul>	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 <b>only "brake" to slow spread</b>
Incubation period	• The incubation period is a median of 5.5 days (up to 14 days) <sup>1, 10,</sup> (vs 3-day period for common flu <sup>1</sup> ); data suggests that viral shedding continues beyond symptom resolution <sup>6</sup>	People are contagious for longer periods than the flu or other illnesses, requiring longer bouts of quarantine to suppress spread
Fatality	<ul> <li>Case fatality rates are trending at 7.1% globally<sup>8</sup> (vs. 0.1% for flu)<sup>9</sup></li> <li>Estimates for infected fatality rate are 0.3%-1.3% based on assumptions around the number of undiagnosed individuals<sup>13</sup></li> </ul>	Fatality is orders of magnitude higher than typical influenzas
Portion of cases asymptomatic but contagious	<ul> <li>COVID-19 can be spread asymptomatically<sup>5</sup></li> <li>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<sup>11</sup></li> <li>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<sup>12</sup></li> <li>In cohorts of younger individuals (e.g., pregnant woman, sailors on USS Theodore) the proportion of asymptomatics exceeded 60%<sup>15, 16</sup></li> </ul>	People who feel "fine" are capable of – and are transmitting COVID-19 to others
Portion of cases reaching "critical/"severe" infection	<ul> <li>Approximately 19% of confirmed cases are considered "severe" or "critical", requiring hospitalization; 1/4th of those need ICU beds<sup>7</sup></li> </ul>	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 travelassociated 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) "NOW THIS IS NOT THE END. IT IS NOT EVEN THE BEGINNING OF THE END. BUT IT IS, PERHAPS, THE END OF THE BEGINNING."

- Sir Winston Churchill

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



#### EARLY SOCIAL DISTANCING MEASURES APPEAR TO HAVE WORKED

OW COVID-19 Projections (select countries) – Active cases per million May 5, 2020



### **HOW LONG SHOULD WE CONTINUE WITH CURRENT CONTAINMENT MEASURES?**

A number of factors impact how quickly a geography can consider it 'safe' to reopen



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

## 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



### **EXECUTIVES WILL OPERATE WITH A PERVASIVE RISK OF DISRUPTION**



#### **'CRISIS MANAGEMENT' ISN'T ENOUGH**

		Critical considerations/impacts	Key questions
01	Seemingly "random" regional shutdowns		• Do I have adequate insights to anticipate risks and act early (vs. just react like in Phase 1)?
		<ul><li>Supply chains and facility locations</li><li>Travel risks</li></ul>	<ul> <li>Have I begun to diversify my supply chain and distribution channels?</li> </ul>
		Customer demand	<ul> <li>Do I have adequate resiliency plans, including for locations not impacted in Phase 1?</li> </ul>
			• Do I understand my financial risks at scale?
02	20% absenteeism, with some employees severely ill	<ul> <li>Staffing challenges and need for redundancy</li> </ul>	Whom do I allow back onsite and when?
		<ul> <li>Adequate protection, and the company's role in monitoring</li> </ul>	• Do I know where my "hot spots" for employee risk are?
		<ul> <li>Scalability of policies and benefits</li> </ul>	• Do I have flexible staffing and executive coverage plans?
03	Significant mental health and wellbeing challenges for employees	<ul> <li>Cultural fractures as employees cope with social isolation, childcare responsibilities, health concerns, and financial stresses</li> </ul>	<ul> <li>Have I invested in culturally-appropriate, virtual mental health support for my employees? Are they using it?</li> </ul>
		Video, email, and calendar overload	Are current work-from-home support mechanisms
		<ul> <li>Reduced productivity and impaired decision- making</li> </ul>	durable for 12-15 months?
04	Unequal economic impact across sectors	Significant small business failure	<ul> <li>How are my customers and business partners affected, and how will that impact my business?</li> </ul>
		Some sectors never bounce back	<ul> <li>How has strategic control in my sector shifted?</li> </ul>
		<ul> <li>New services and categories arise as customer needs are shaped by COVID-19</li> </ul>	<ul> <li>Do I have strategic opportunities for partnership or M&amp;A?</li> </ul>
	Changed customer behaviors (perhaps permanently)	Preference for digital vs. physical	Do I understand how customer and employee
05		Generational risk aversion	perceptions are like to shift?
vv		Reduced trust in institutions	What are the opportunities for my business?
		Doubling down on local experiences	<ul> <li>What are the risks for my business?</li> </ul>



# SCENARIO MODELING: OLIVER WYMAN PANDEMIC NAVIGATOR

#### **OVERVIEW OF OLIVER WYMAN'S PANDEMIC NAVIGATOR**

Supports private and public sector clients	<ul> <li>Draws on expertise from our Health &amp; Life Sciences and Financial Services practices</li> </ul>
Supports private and public sector clients	<ul> <li>Underlying models are physics-informed, data-driven yet causally confirmed and use-case specific</li> </ul>
Projects detected and undetected cases under	<ul> <li>Estimates future outcomes for both Detected (tested and officially confirmed) and Undetected (e.g. asymptomatic) cases</li> </ul>
different containment choices	<ul> <li>Compartmental model covers 40 countries and the 50 US states, updated continuously for emerging data</li> </ul>
Evidence-based causal links	<ul> <li>Linkages with mobility and government response – core model index compared to Google's Community Mobility indices as well as Oxford's Government Stringency Index</li> </ul>
	Primarily descriptive in nature, rather than 'predictive'
Generates 18-36 month scenarios linked to underlying epidemiology and suppression	<ul> <li>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</li> </ul>
Economic impacts by sector modelled for	<ul> <li>Health outcomes are fed into modules which estimate the economic</li> </ul>

impacts on 40+ sectors of the economy

scenarios

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

We have linked our 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	<b>v</b>
Pick a region	
Italy	
United Kingdom	
Sweden	
Czechia	
Brazil	
New York	

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



Transit Stations -- Mobility Index Change vis-à-vis Baseline

OW Covid-19 Transmission Rate Based on Reported Universe (5-Day Average -- RHS)

### 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



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



## 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 (TO) and earlier projections from the previous 7 days



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



#### **Forecasted trajectories for New Cases**



#### Forecast trajectories for Active Cases (confirmed-deathrecovered)



#### 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



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



**5** Day Moving Average Transmission Rate for Italy

1.

## OUR SCENARIO GENERATION AND ANALYIS CAPABILITY COVERS A HOST OF SCENARIOS

**Example Scenario** 



Infection rate managed for a while, but not until the end of summer

#### U.S. – Active Cases



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



#### **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:

https://www.oliverwyman.com/coronavirus



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