

RESPONDING TO COVID-19

Almanac Highlights

For complete Almanac, please contact
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May 6, 2021 update

INTRODUCTION: COVID-19 ALMANAC



Context and purpose

The novel coronavirus has infected millions 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 **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

OLIVER WYMAN'S CORONAVIRUS ALMANAC

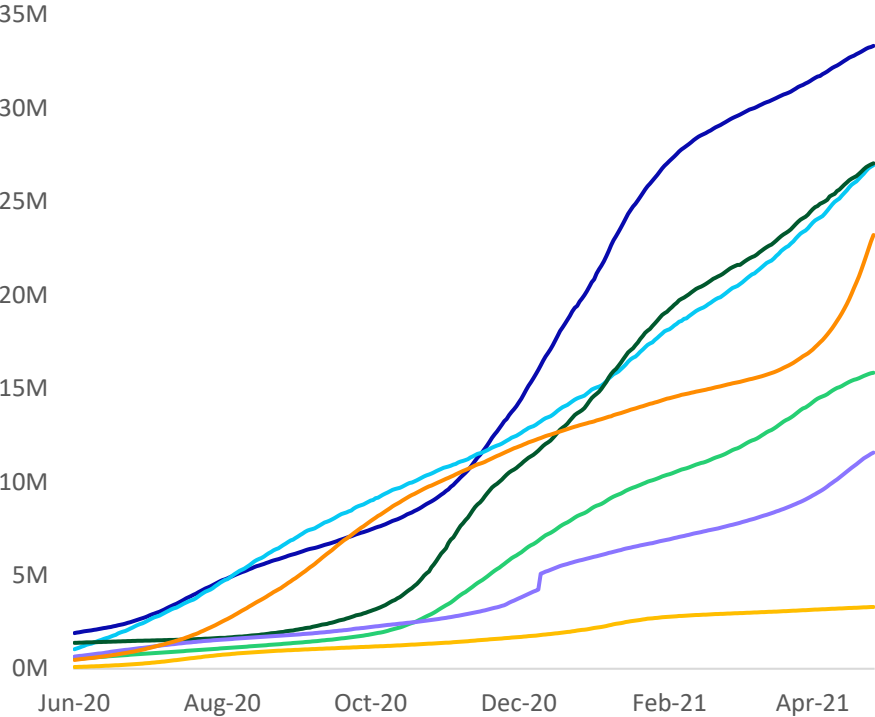
This Almanac contains the latest perspectives on key areas related to the COVID-19 pandemic

Section	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"> 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
An end to the cycle: therapeutics, vaccines and cumulative immunity Sample page: 7	<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 vaccination will be critical to bring economies and communities fully “back to normal”
Tracking the Impact of Variants Sample pages: 8-9	<ul style="list-style-type: none"> Categories of known variants and their mutations Spread globally and in the U.S. 	<ul style="list-style-type: none"> Variants should be categorized by the mutations they exhibit rather than their geographic origins Different variants present different risks and require different responses
Global News Sample pages: 10-13	<ul style="list-style-type: none"> Global developments On-going risk across the globe 	<ul style="list-style-type: none"> As countries vaccinate and reopen, we are tracking progress, synthesizing best practices and projecting anticipated trajectory
US News Sample pages: 14-18	<ul style="list-style-type: none"> US opening approach and initial learnings Risk of future disruptions 	<ul style="list-style-type: none"> As the US begins to exit out of the pandemic, we are tracking outcomes, vaccination progress, and modeling out progress to the possible herd immunity threshold
Pandemic Navigator Sample pages: 19-20	<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 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 freely available online
Testing and Diagnostics Sample page: 21	<ul style="list-style-type: none"> Current landscape of available tests Emerging tech profiles & development news 	<ul style="list-style-type: none"> The diagnostic landscape is evolving rapidly to provide more convenient, scalable testing options The emergence of testing and vaccine passports / tracking methodology is critical in the progress to normalcy
Returning to Work Sample page: 22	<ul style="list-style-type: none"> Different employer plans with respect to vaccination Industry deep dives 	<ul style="list-style-type: none"> Employers have a varied degree of involvement with vaccinations, and it depends heavily on industry and the nature of their work Deep dives on specific industries and companies within those industries can provide broader insight as to the general employer-vaccination landscape

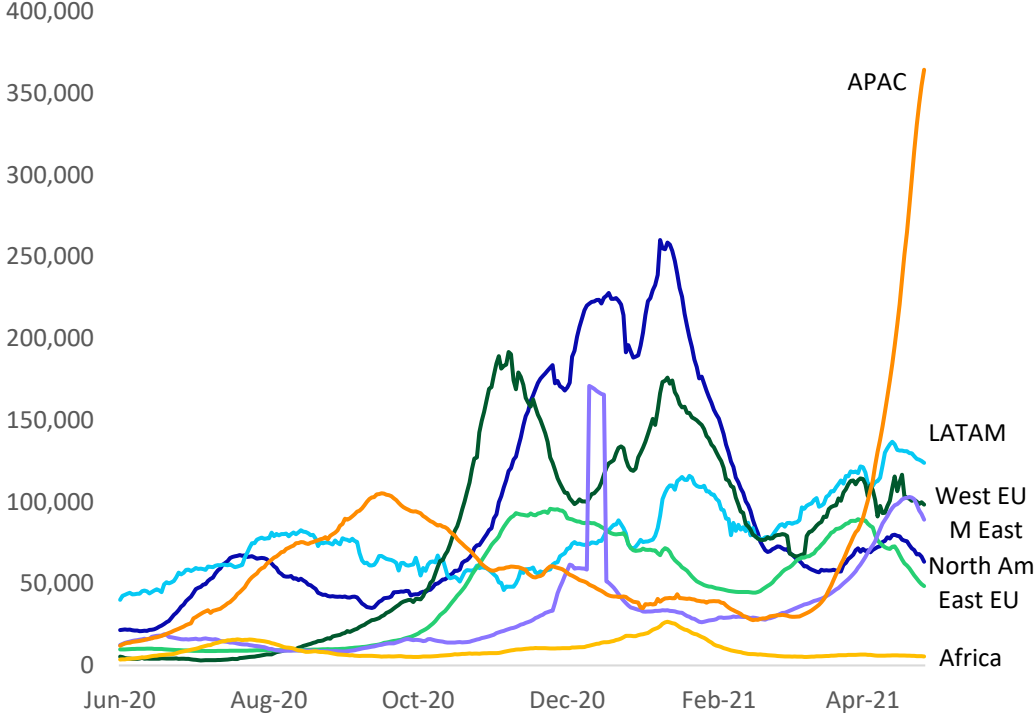
COVID-19 TRENDS AND SPREAD OF THE DISEASE

Cases are rising rapidly in the APAC region, largely driven by exponential case growth in India, while the rest of the world is largely seeing plateauing or declining new cases

Cumulative Confirmed Cases of COVID-19¹



New Cases Per Day of COVID-19¹ 7-day moving average



North Am LATAM West EU East EU M East Africa APAC

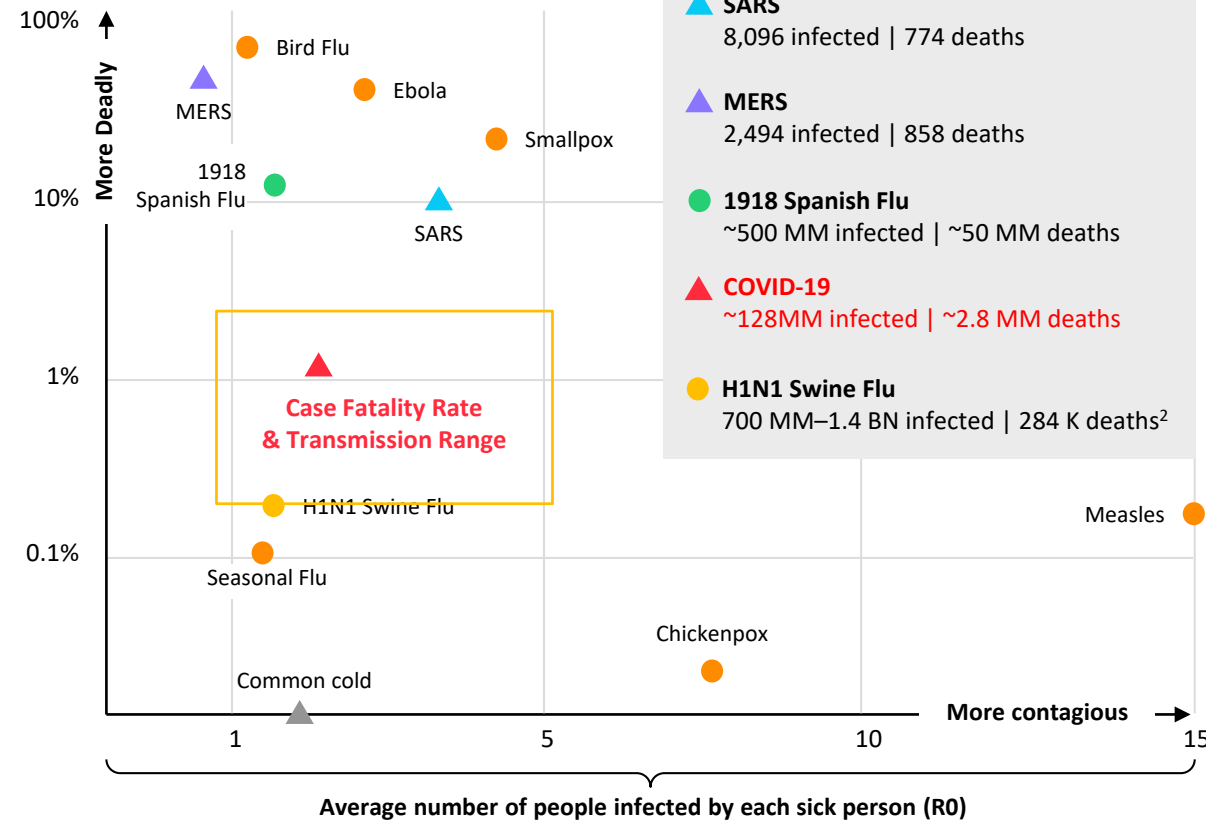
1. Data from [OW Pandemic Navigator](#)

HOW DOES COVID-19 COMPARE TO OTHER DISEASE OUTBREAKS?

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



▲ Denotes Coronaviruses

Additional details

- R-naught (R0) represents the average number of cases an infected person will cause
 - R0 for the seasonal flu is around 1.3²
 - Estimates for initial R0 for SARS-CoV-2 have ranged between 2 and 3³ on the lower end and closer to 5.7 on the higher end⁶
 - R0 is time and region dependent, varying significantly based on country and individual measures used to contain the virus (e.g., wearing masks, socially distancing, shutting down businesses)
- Early evidence suggests COVID-19’s transmission is highly variable, with most infections resulting in no subsequent infections and a few resulting in many⁷
- The global case fatality rate for confirmed COVID-19 cases is currently 2.0%⁵; the rate varies significantly by country (e.g., Italy – 3.1%, South Korea – 1.7%⁵)
- We expect case fatality rates to fluctuate as vaccination continues, treatment options improve, testing expands, demographics of the ill change, and existing cases are resolved

1. New York Times ([link](#)) for fatality and R-naught comparisons, CDC timelines for case numbers (selected link: CDC [SARS](#) timeline); 2. Updated CDC estimates ([link](#)); 3. The R0 for the coronavirus was estimated by the WHO to be between 1.4–2.5 (end of January estimate) ([link](#)), other organizations have estimated an R0 ranging between 2–3 or higher ([link](#)); 4. CDC Paper ([link](#)); 5. Calculated as Number of Deaths/Total Confirmed Cases as reported by John Hopkins University. 6. Emerging Infectious Diseases ([link](#)) 7. Science ([link](#))

AT A GLANCE: SUMMARY FACTS

	Key facts	Key unknowns
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 others¹; R0 for the seasonal flu is around 1.3² The CDC estimate VoC transmission to be between 20-50% more transmissible³ 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 response⁴ 	<ul style="list-style-type: none"> Frequency of transmission by asymptomatic individuals and kids
Current human immunity	<ul style="list-style-type: none"> No herd immunity exists yet as the virus is novel in humans There is emerging evidence that some individuals have cross-reactive antibodies from exposure to other coronaviruses. It remains to be seen if these are protective¹⁷ 	<ul style="list-style-type: none"> Whether protective immunity is conferred and how long it lasts
Infectious cycle	<ul style="list-style-type: none"> COVID-19 can be spread asymptotically⁵ The incubation period is a median of 5.5 days (up to 14 days)^{6,7} (vs 3-day period for common flu⁶) Several epidemiological studies estimate that the infectious period begins 2-3 days prior to onset of symptoms, peaks 0.7 days before symptom onset and then declines within 7 days⁸ While viral genetic material can linger in the body for 2-4 weeks, live virus cannot be cultured after day 11 of illness⁸ 	<ul style="list-style-type: none"> Exact timing of when an individual is no longer contagious
Fatality	<ul style="list-style-type: none"> Case fatality rates (CFR) are trending at 2.0% globally⁹ (vs. 0.1% for flu)⁶ Infected fatality rate (IFR) is estimated at 0.68% (0.53-0.82%) though the data shows a significant degree of heterogeneity¹⁰ 	<ul style="list-style-type: none"> True fatality rate
Portion of cases asymptomatic but contagious	<ul style="list-style-type: none"> 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%^{13, 14} 	<ul style="list-style-type: none"> Why some people are asymptomatic or have mild illness while others show severe symptoms
Portion of cases reaching “critical”/ “severe” infection	<ul style="list-style-type: none"> Data from the US CDC suggested that approximately 14% of confirmed US cases required hospitalization; 1/6th of those needed ICU beds^{6, 16} Among states that report hospitalizations, recent data suggests ~9-10% of cases now require hospitalization 	

1. 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](#)); 2. CDC Paper ([link](#)); 3. CDC 4. Science ([link](#)) 5. JAMA. “Presumed Asymptomatic Carrier Transmission of COVID-19” 6. CDC 7. Annals of Internal Medicine ([link](#)) 8. Academy of Medicine Singapore ([link](#)) 9. JHU. 10. medRxiv ([link](#)) 11. Nature ([link](#)), Eurosurveillance Paper ([link](#)) 12. ZMEScience report ([link](#)) 13. Business Insider ([link](#)) 14. NEJM ([link](#)) 15. 7. China CDC, JAMA ([link](#)) 16. Note: However, hospitalization status was only known for ~50% of all cases in CDC study 17. Science Immunology ([link](#))

RETURN TO NORMALCY: WE WILL BEGIN TO RECOVER WHEN OUR CUMULATIVE IMMUNITY REACHES THE POSSIBLE HERD IMMUNITY THRESHOLD

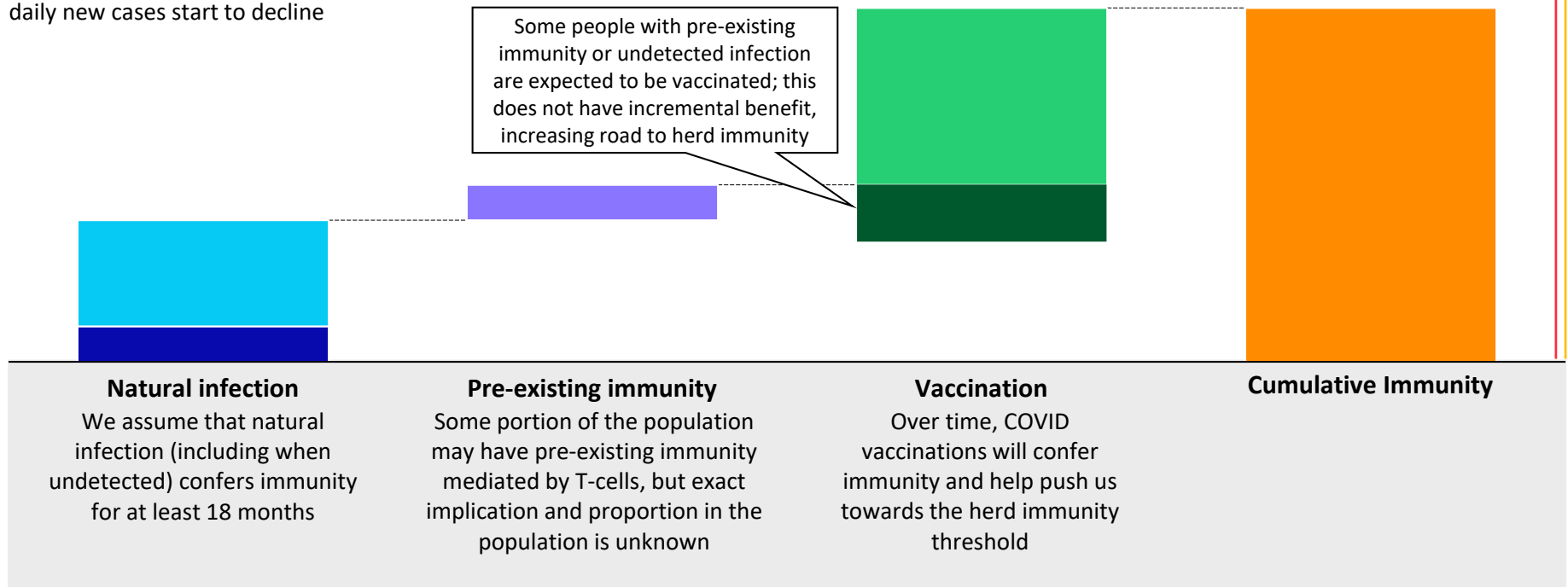
Building blocks of herd immunity – illustrative example

Possible Herd Immunity Level (pHIL)

The point at which transmission stops

Possible Herd Immunity Threshold (pHIT)

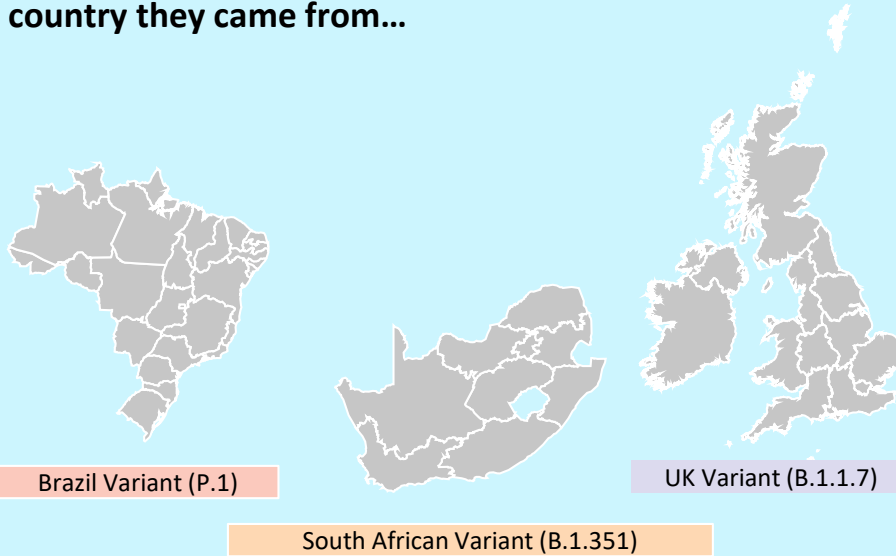
The point at which effective reproduction rate without most restrictions is equal to 1 and daily new cases start to decline



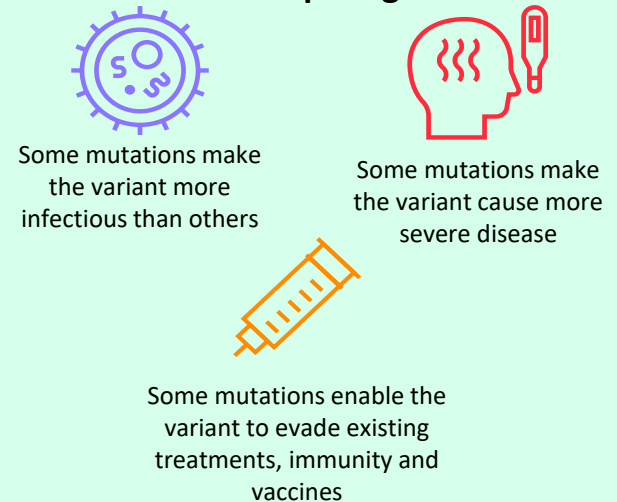
TURNING OUR FOCUS TO MUTATIONS

As more variants are being discovered, our focus should turn to the mutations they have, not their geographic origin

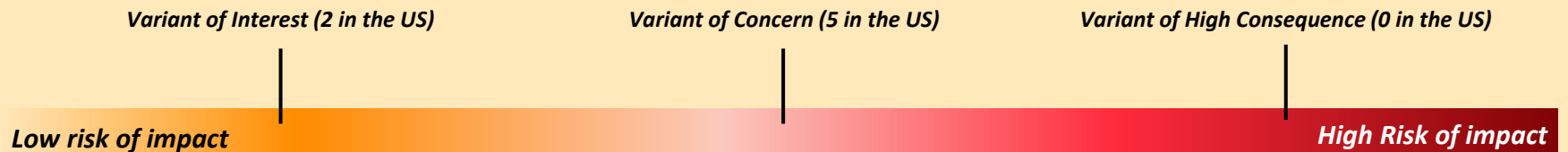
Instead of thinking about variants in the context of what country they came from...



...we need to consider the effect of specific mutations and which require greater concern



In the US, the CDC classifies variants based on the nature of their mutations and the severity of the impact they might have on existing ideas of transmission, severity and immunity



MUTATION PREVALENCE ACROSS VARIANTS

Of variants currently discovered, many share mutations with others, leading them to behave in similar ways

Key Mutation ¹	Description of Mutation	Variants of Concern					Variants of Interest	
		B.1.1.7 (UK, Dec '20)	B.1.351 (SA, Dec '20)	P.1 (BR, Jan '21)	B.1.427 (CA, Jan '21)	B.1.429 (CA, Jan '21)	B.1.526 (NY, Oct '20)	B.1.525 (UK, Dec '20)
E484K	Common mutation that has been shown to evade existing immunity and treatments	Has mutation	Has mutation	Has mutation	Doesn't have mutation	Doesn't have mutation	Has mutation	Has mutation
N501Y	Mutation that helps the virus more effectively bind to human cells, increasing transmission	Has mutation	Has mutation	Has mutation	Doesn't have mutation	Doesn't have mutation	Doesn't have mutation	Doesn't have mutation
K417N	Another common mutation that helps the virus bind to cells	Doesn't have mutation	Has mutation	Has mutation	Doesn't have mutation	Doesn't have mutation	Doesn't have mutation	Doesn't have mutation
L452R	Preliminary studies suggest increased infectivity and replication	Doesn't have mutation	Doesn't have mutation	Doesn't have mutation	Has mutation	Has mutation	Doesn't have mutation	Doesn't have mutation

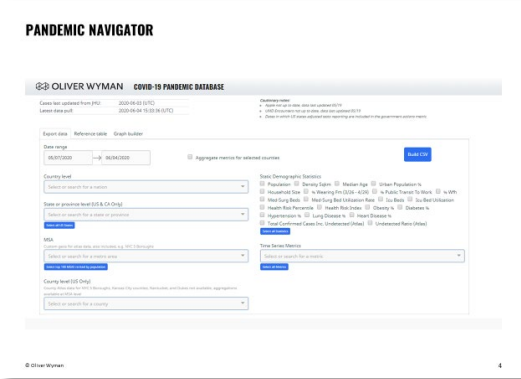
■ Has mutation ■ Doesn't have mutation

Since many mutations are common across variants, our **response should be tailored to mutations and their impact**, rather than specific variants and where they come from

1. These are the key mutations primarily found in variants in the US – there are many multiples more that have been discovered and researched globally

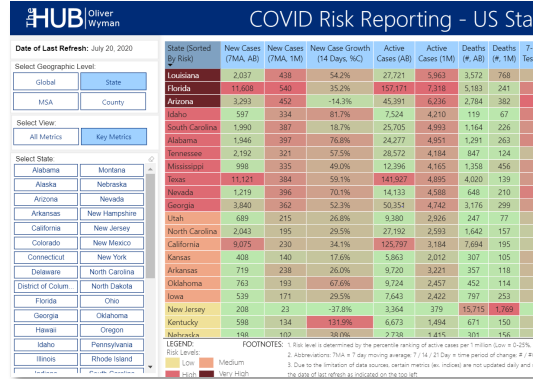
OW'S GLOBAL MONITORING CAPABILITIES PROVIDE DEEP AND ACTIONABLE INSIGHT TO GOVERNMENTS, EXECUTIVES AND PUBLIC HEALTH AUTHORITIES

Daily updated database covering 50+ metrics and 200+ countries; access to relevant COVID information in one convenient location



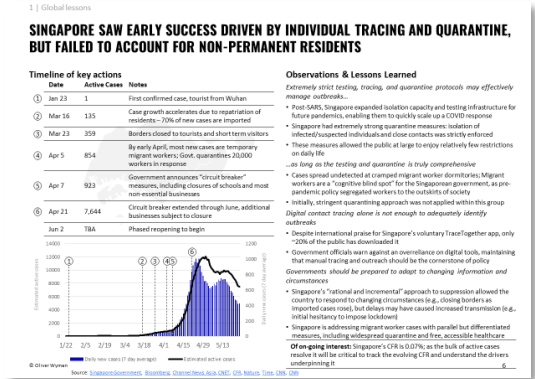
- Complete history of pandemic by region (cases, deaths, infection rates, testing)
- Daily updated case projections for select countries of interest
- Mobility indices and leading indicators
- Population risk factors, include health risks, urban density, age and demographics
- Flexible chart builder and data export tool; explore metrics from any region over any period of time

Risk tracker and dashboard identifying likely hotspots and areas of resurgence with key global archetypes



- Convenient dashboard highlighting key risk factors and current pandemic status by day
- Deep dive worksheets exploring mobility, case, and infection rate growth over variable periods of time
- Analysis of mobility correlations with Oliver Wyman derived infection rates
- Flexible segmentation and archotyping tool, with editable risk thresholds

In-depth profiles highlighting global themes and detailed developments from any given country



- Timeline of key developments and government responses over the lifetime of COVID in a given country
- Key lessons learned from each region – detailed notes on what caused a country's response to be successful (or not)
- Themes that governed a country's COVID response policy and philosophy
- Other cultural or endogenous factors that directly affected the impact of the disease

THERE ARE A WIDE RANGE OF METRICS THAT CAN HELP INFORM THE “HEALTH RISK” OF A PARTICULAR GEOGRAPHY

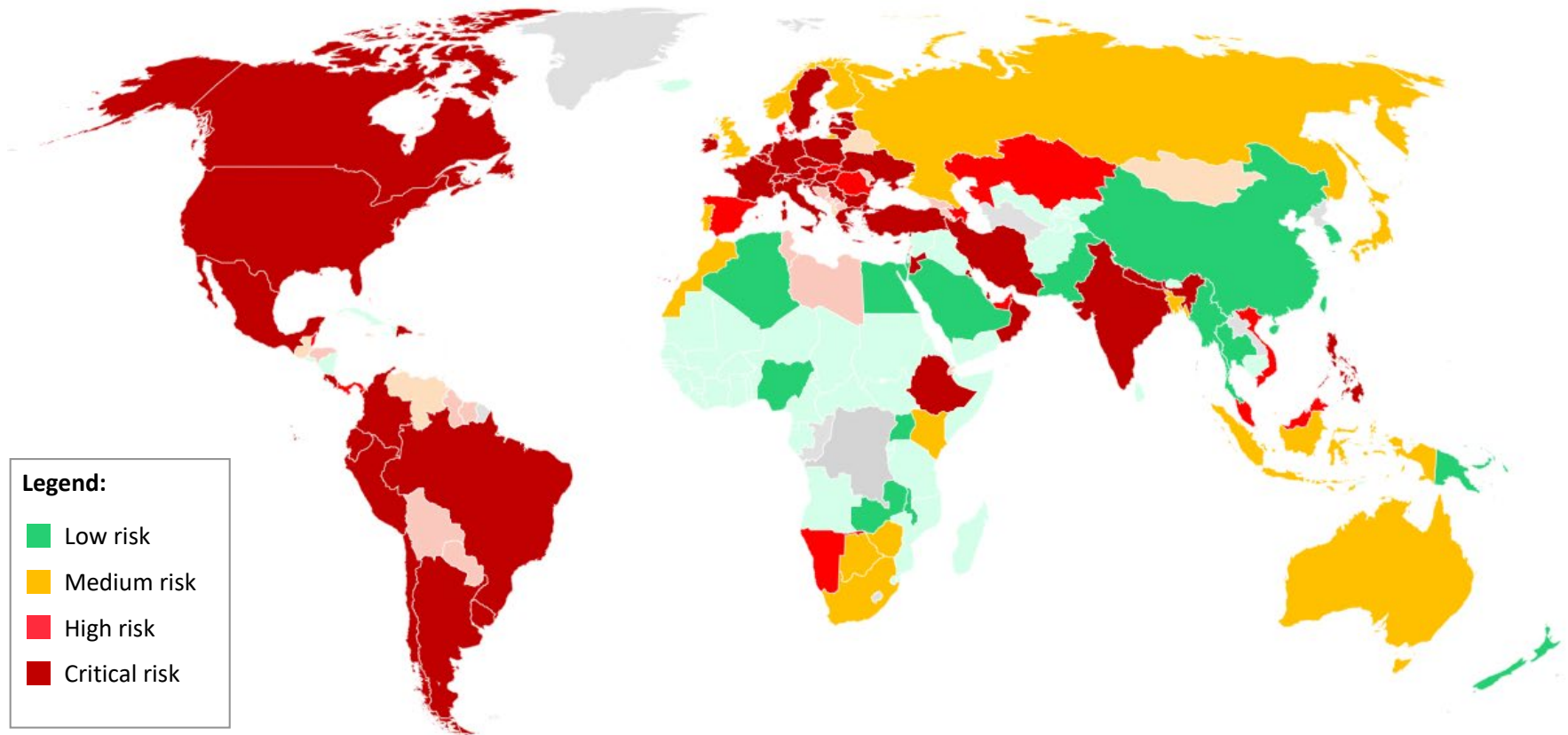
1 How severe are outbreaks today?	2 What is the near-term outlook?	3 How widespread is testing and contact tracing?	4 How is human behavior changing?
<ul style="list-style-type: none">• Active cases• Reproduction rate• Deaths	<ul style="list-style-type: none">• Active case forecasts• Projected reproduction rate• Projected deaths	<ul style="list-style-type: none">• % positive tests• # of people tested• Level of contact tracing	<ul style="list-style-type: none">• Impact of mobility on transmission• Changes in government stringency

These factors combined into a “health risk score”, alongside judgement on the ground, can help quickly assess the potential health risk posed by geography in a structured way

WHAT DOES GLOBAL RISK LOOK LIKE AROUND THE GLOBE?

High rates of active cases in both the Americas and Western EU cause scores to climb back up to critical for many countries in each region; rising cases in India have led its score to jump up from medium to critical

Oliver Wyman Health Risk Assessment^{1,2,3,4,5}



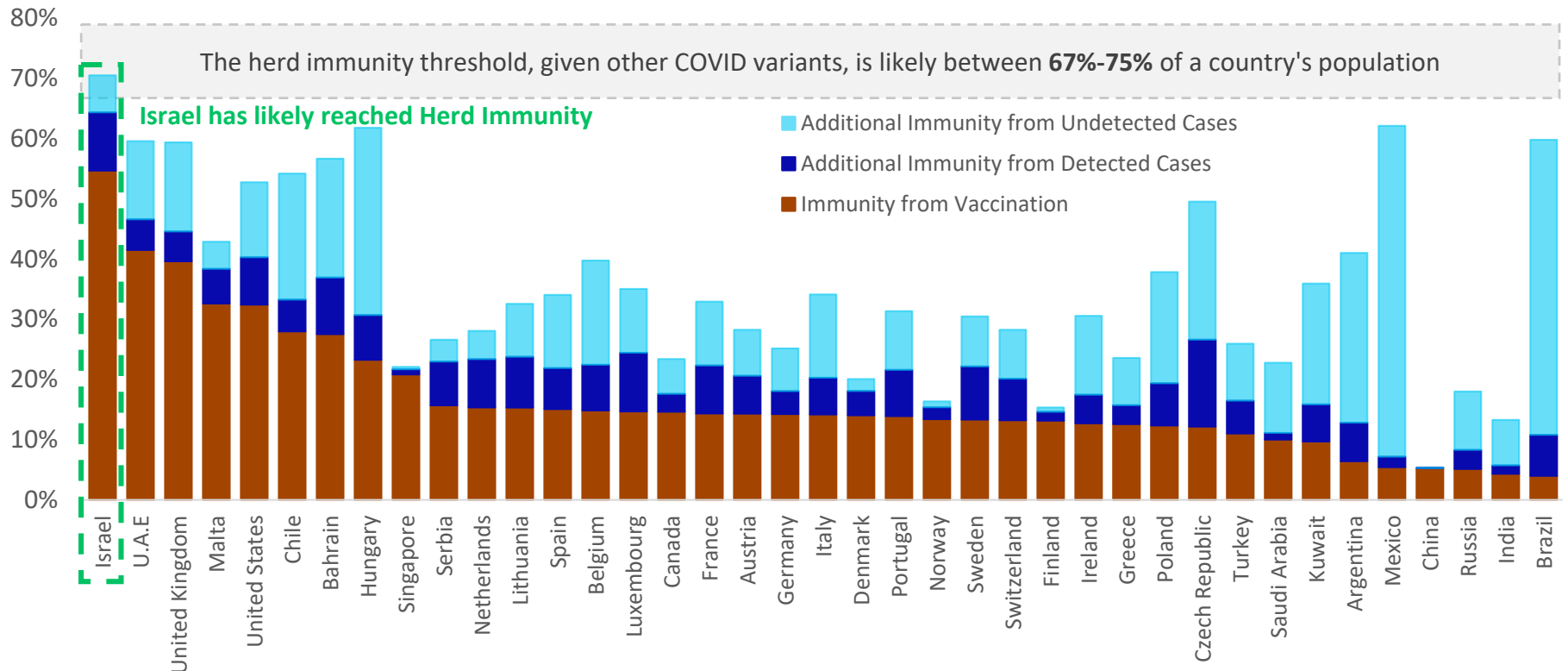
© Oliver Wyman 1. Highlighted countries indicate risk monitoring coverage 2. Due to the heterogenous nature of outbreaks in large countries, certain countries dealing with substantial outbreaks in certain localities (India, Australia) may appear to be low risk at an aggregate level 3. Countries with fewer than 7 data sources and no OSI index or no active case information are "pastel" colored to indicate the incomplete nature of the available data; 4. Israel and UAE have a critical designation due to high baseline active cases, but new cases are rapidly dropping as a by-product of an effective vaccination campaign and we expect this score to shift lower in the future; 5. The accuracy of these risk scores relies on the accuracy and validity of publicly available data 12

GLOBAL PATH TO HERD IMMUNITY

Israel continues to stand out with its rapid vaccination roll-out, with a few other countries like the US, UK, and UAE also performing strongly

% with immunity by natural infection or effective vaccination by country^{1,2}

Data as of May 2nd, 2021



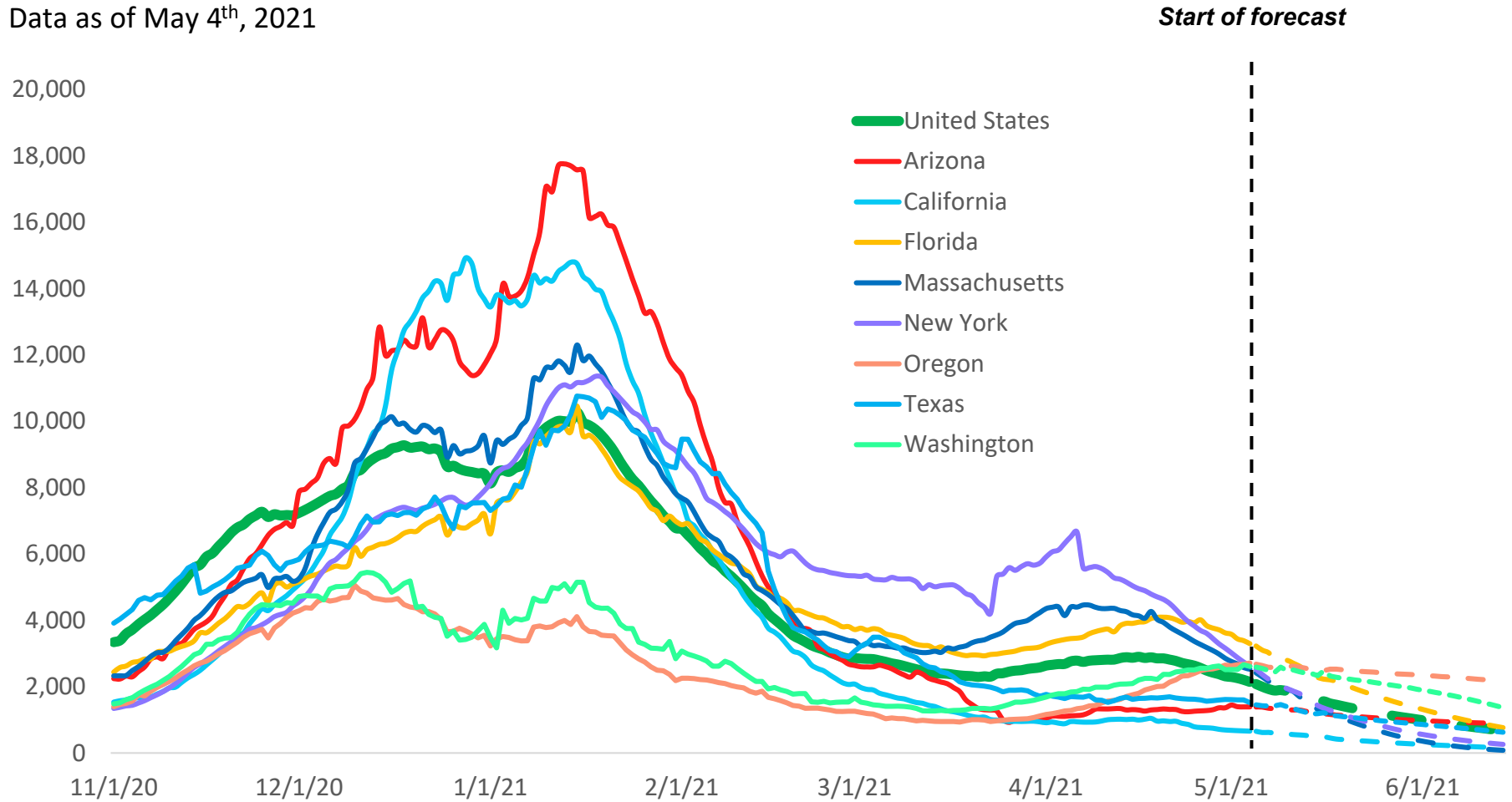
We estimate a **handful of countries** (US, UK, Mexico, Brazil) to reach herd immunity in the next few **months**, but countries relying on natural infection must be wary of variants with high reinfection rates

1. As we learn more about the risk of reinfection, we may see some countries relying on high levels of natural infection lose significant progress towards herd immunity. 2. Effective vaccination counts use a weighted average of efficacy rates for first and second injections across manufacturers. We also assume individuals who were naturally infected and received a vaccine dose will be counted towards immunity from vaccination and not natural infection (assumes those with previous natural infection are just as likely as the noninfected population to receive a vaccination). Undetected cases vary by region and are estimated based on IFR data and deaths. Vaccination data from [OWID](#); [JHU](#)

US OUTLOOK: CASES AROUND THE COUNTRY ARE TRENDING LOWER, CONTINUING THEIR DECLINE OR BEGINNING TO LEVEL OFF

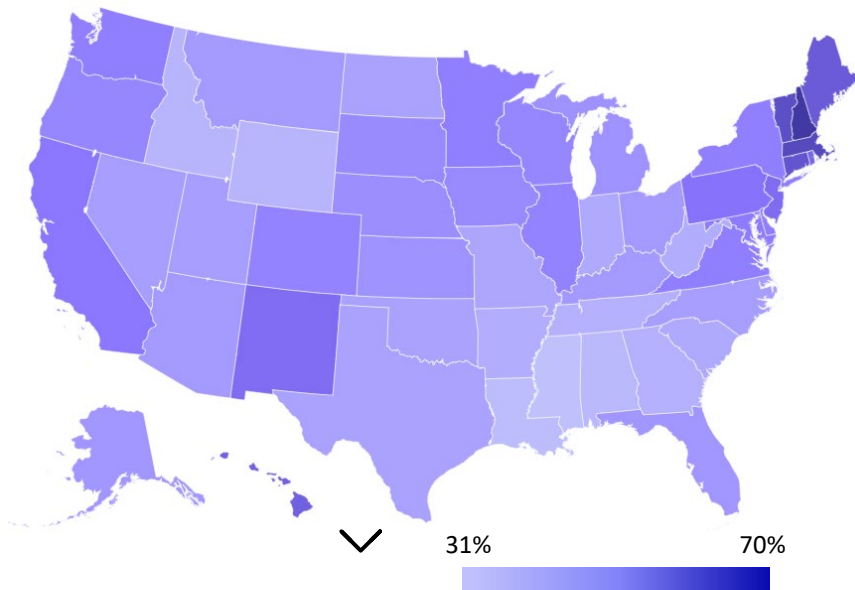
Active cases per Million for select states

Data as of May 4th, 2021



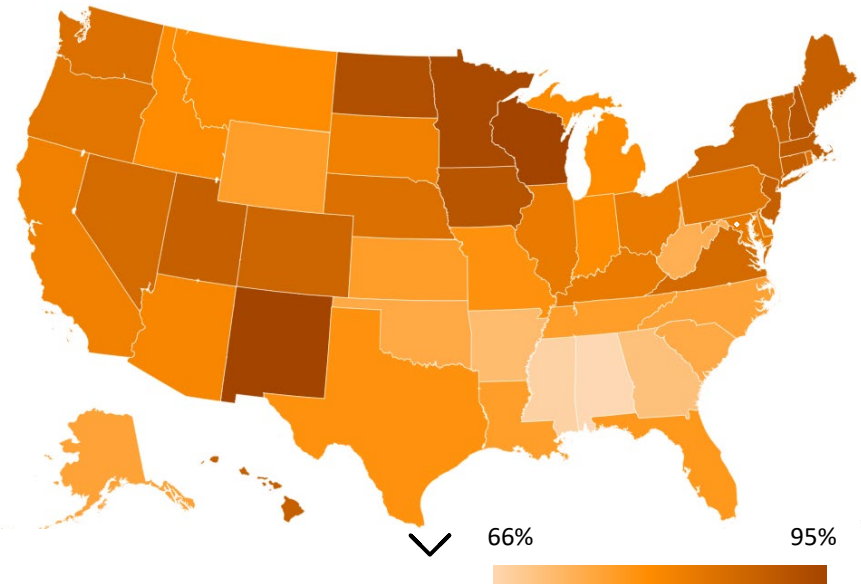
THE US VACCINATION CAMPAIGN HAS ACCELERATED RAPIDLY AND IS AIMING TO REACH 70% OF AMERICANS WITH AT LEAST ONE SHOT BY THE 4TH OF JULY

Share of population receiving at least one dose¹
As of May 4th, 2021



- **144.2 million** (~44% of U.S. population) people have received their first dose as of May 4th
- More than **104 million** (~32% of U.S. population) people have been fully vaccinated as of May 4th
- Biden reached announced goals of vaccinating 200M people within his first 100 days in office, and expects to celebrating July 4th as normal
- The U.S. is currently administering **2.29M shots per day**

% of vaccine supply used¹
As of May 4th, 2021



- Vaccine utilization has remained steady for the past month, averaging 79%, compared to last month's 81%
- Many states are seeing evidence of waning demand:
 - Appointments that were previously hard-to-get are now going unfilled
 - States like Mississippi are asking the government to stop shipping the vaccine as they can't find people to take the shot

1. [NYT](#); *Data may be lagged as states report vaccination totals at different rates 2. [Washington Post](#)
© Oliver Wyman

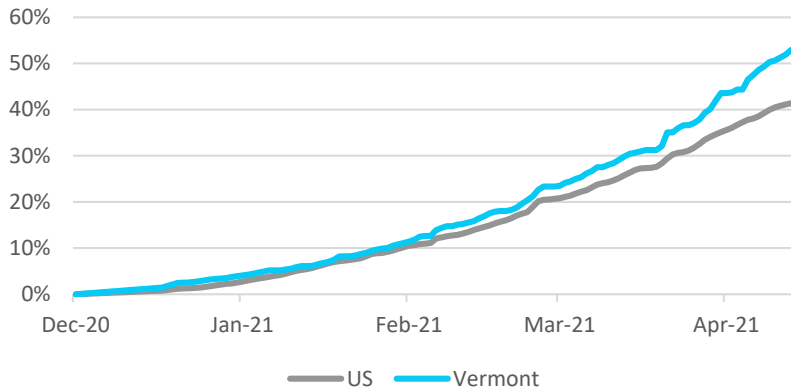
THE PACE OF VACCINATION LOOKS DRAMATICALLY DIFFERENT ACROSS THE U.S.

Some states have seen their vaccination pace flatten off while others continue a rapid rollout

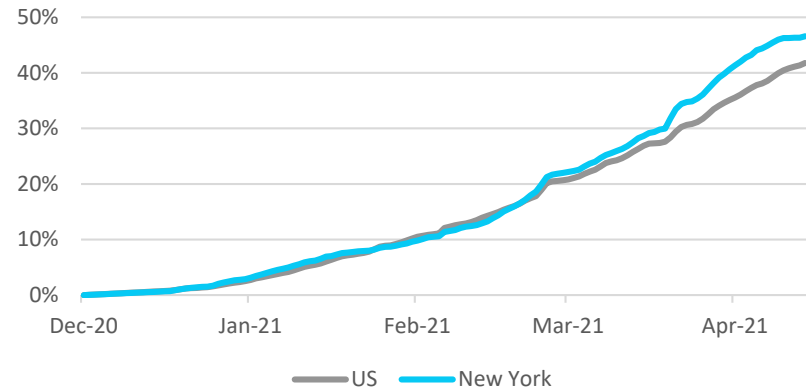
% of population with at least one dose for select states

— Above average US pace — Below average US pace

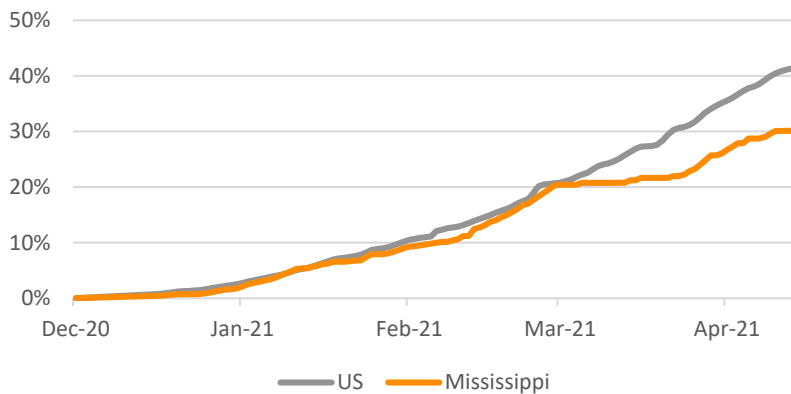
Vermont



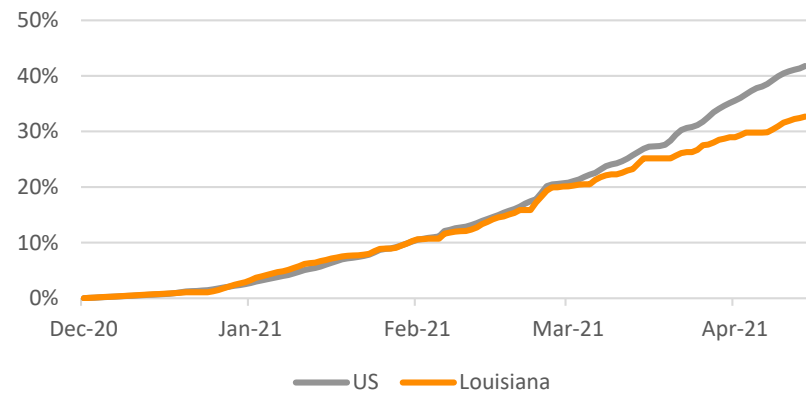
New York



Mississippi



Louisiana



Sources: [OWID](#); [JHU](#); [NYT](#)

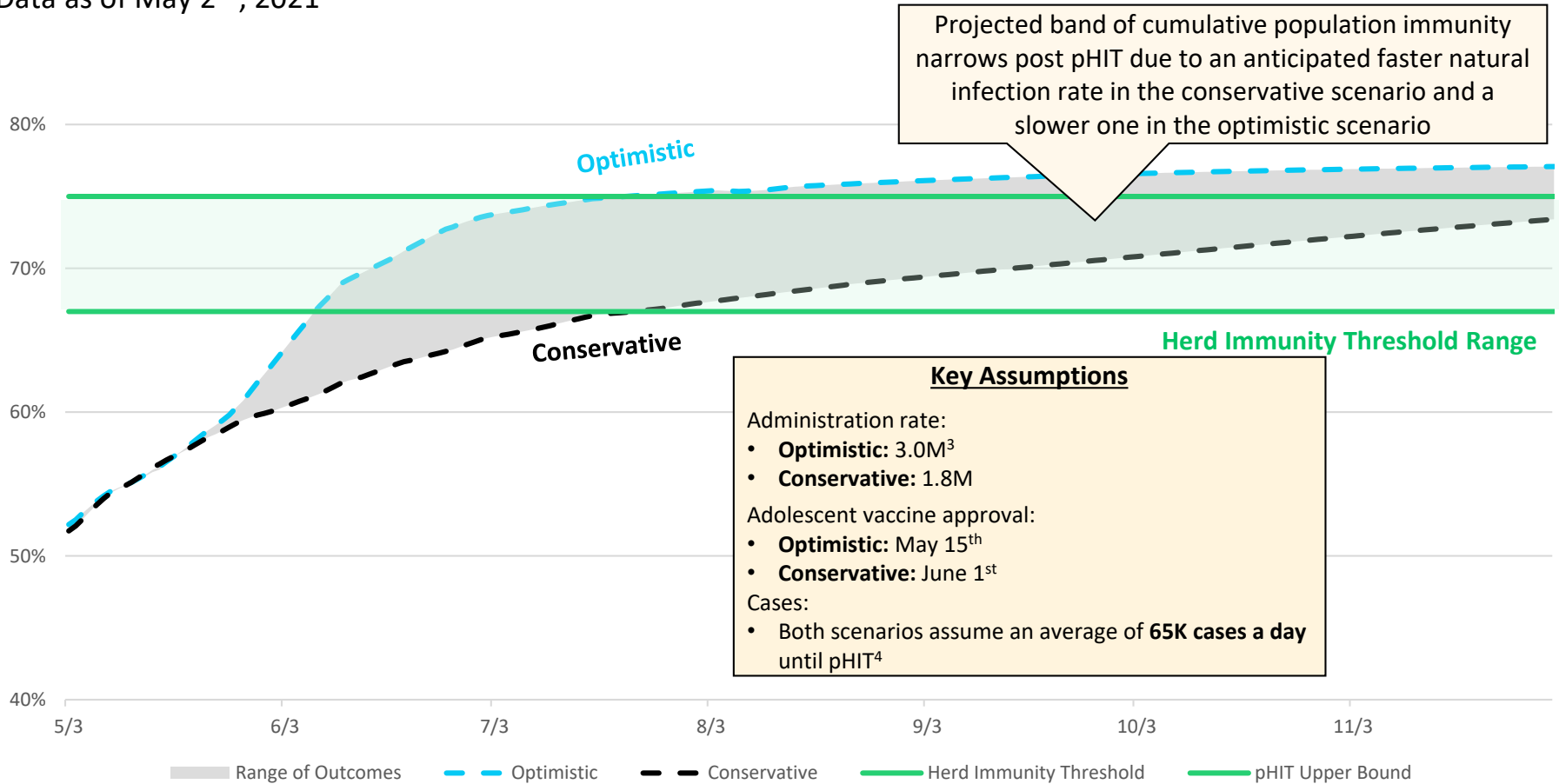
© Oliver Wyman

US: REVISED ASSUMPTIONS IMPROVE AVERAGE PHIT TIMING FOR THE US

Driven primarily by an earlier than expected approval of an adolescent vaccine, optimistic potential herd immunity threshold (pHIT) timing in the US has moved up from mid to late summer to early-summer

% with immunity by effective vaccination or natural immunity^{1,2}

Data as of May 2nd, 2021



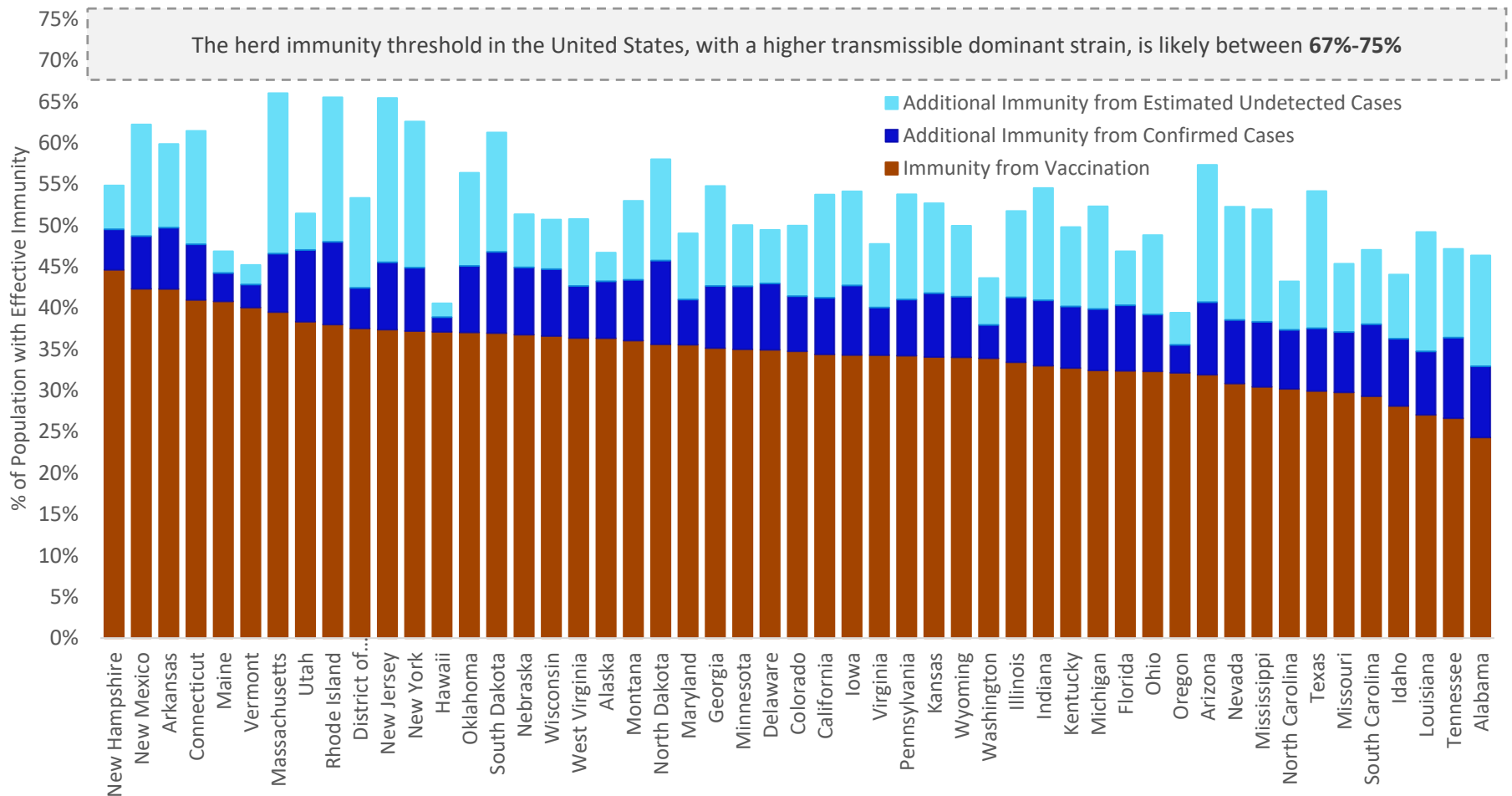
1. Immune individuals (either from natural infection, or vaccination) are assumed not to transmit the virus. Given that most vaccine trials assessed efficacy against symptomatic illness, this assumption may prove to be overly optimistic, i.e. efficacy with respect to asymptomatic but contagious illness may be lower than is assumed here. In addition, vaccine efficacy for J&J clinical trial (66%) was assessed with respect to moderate to severe disease so this efficacy may be overstated when applied to case transmission. 2. In our optimistic scenario, it is assumed that a vaccine approved for 12-15 year olds will become available in July 2021 or earlier, while a pediatric vaccine for ages 11 and under does not become available until 2022. 3. Administration rate is the average number of doses administered until all willing individuals are vaccinated. 4. 71% is used for pHIT, SIR logic applied after threshold to project case growth. Sources: [OWID](#); [JHU](#)

US: PATH TO HERD IMMUNITY THRESHOLD

A handful of states are approaching the herd immunity threshold, largely owing to a rapid vaccination campaign

% with immunity by effective vaccination or natural infection by state^{1,2}

Data as of May 2nd, 2021



1. As we learn more about the risk of reinfection, we may see some states relying on high levels of natural infection lose progress towards herd immunity threshold. 2. Effective vaccination counts use a weighted average of efficacy rates for first and second injections across manufacturers. We also assume individuals who were naturally infected and received a vaccine dose will be counted towards immunity from vaccination and not natural infection (assumes those with previous natural infection are just as likely as the noninfected population to receive a vaccination). Undetected cases vary by region and are estimated based on IFR data and deaths. Vaccination data from 1. [NYT](#)

OLIVER WYMAN'S PANDEMIC NAVIGATOR IS A SUITE OF MODELS THAT HAS BEEN HELPING BUSINESS & POLICY LEADERS MAKE DECISIONS DURING THE CRISIS

Elements of the Pandemic Navigator toolkit



Near-term risk monitoring

- Updated daily for 3,000+ U.S. counties and 90+ countries
- Measures detected and undetected cases (i.e., asymptomatic, untested cases)
- Featured by the [CDC](#) and consistently recognized as top-performing in [independent studies](#)



Long-term risk modeling

- Epidemiology scenarios to test impacts of policy measures, behaviors, vaccinations, and latest medical developments
- Measures timing and threshold to achieve herd immunity
- Available for all 50 U.S. states and 90+ countries



Event-specific risk analysis

- Calculates the probability of someone attending a gathering in a specified location (county-level in the U.S.) on a specific date with an active COVID-19 infection
- Calculates the probability of contracting COVID-19, based on conditions at the gathering and attendee profile



Risk scores by geography

- 16-dimensional score that combines current and future cases, public health infrastructure, mobility patterns, and government policy measures in risk score
- Available for 3,000+ U.S. counties and 90+ countries

Visit our [website](#) to see a selection of our analytics.

PANDEMIC NAVIGATOR PERFORMANCE

Over the past six months, our model is emerging as one of the top COVID-19 models according to multiple independent model comparisons

TOP-PERFORMING AMONG MODELS LISTED BY THE CDC

PART OF REICH LAB ENSEMBLE, COMPILATION OF THE BEST MODELS

GRANULAR, COMPARTMENTAL DESIGN FIT FOR DECISION-ORIENTED ANALYTICS

What others are saying about the Pandemic Navigator:

“A” rating according to [National Forecasting Evaluation Report](#) comparing CDC-listed models for deaths forecasts

Only leading model to [beat baseline forecasts 100% of weeks](#), compared to other CDC listed deaths forecasts





Consistently top-performing according to Steve McConnell’s [weekly evaluations of forecast errors](#)

Regularly recognized as leading model in independent modeler’s COVID-19 [“Power Rankings”](#)

Oliver Wyman “instantly became **one of the top-performing models since its release**...one of the few other models to have estimates of **true infections**”

-COVID-19 projections creator

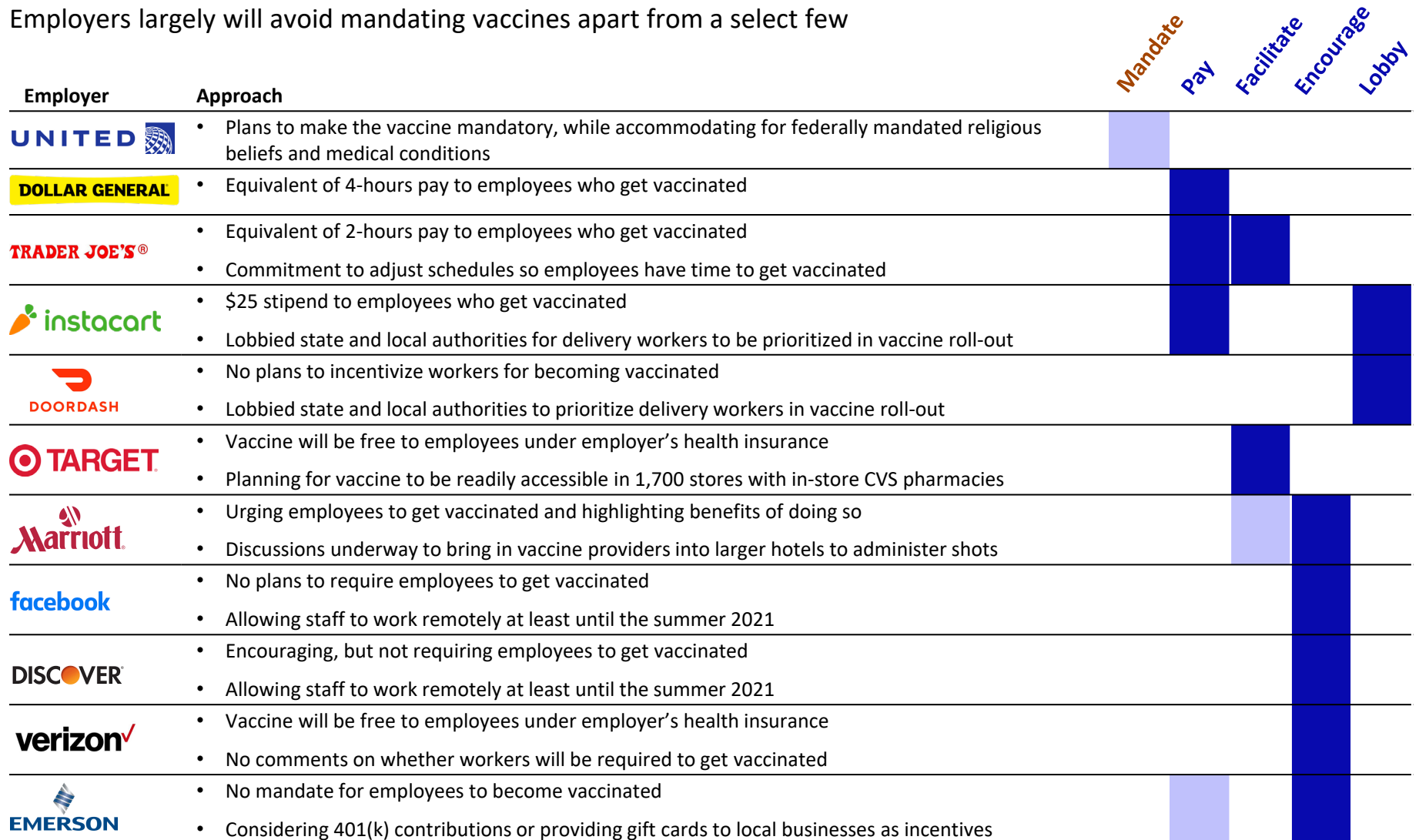
ADVANCES IN TESTING TECHNOLOGY HAVE GIVEN RISE TO AT-HOME ALTERNATIVES TO IN-PERSON TESTING

<i>Currently available for purchase</i>	Administration	Time to results	Cost	Accuracy	Availability
	Completely at-home rapid antigen test using a nasal swab	About 15-20 minutes	\$30	<ul style="list-style-type: none"> • 95% sensitivity • 97% specificity 	Purchase at drugstores or online with a prescription
	At-home rapid antigen test under the guidance of a telehealth professional using a nasal swab	About 20 minutes on a portal with scannable test results	\$25	<ul style="list-style-type: none"> • 64.2% sensitivity for symptomatic cases³ • 35% of sensitivity for asymptomatic cases³ 	Order online after meeting eligibility criteria
	Completely at-home rapid LAMP test using a nasal swab	Less than 30 minutes	\$50	<ul style="list-style-type: none"> • Unavailable 	Currently released to healthcare providers in bulk
	Completely at-home rapid test using a nasal swab	Around 20 minutes	Unavailable	<ul style="list-style-type: none"> • 99% sensitivity • 98% specificity 	Scaling up to a production capacity of 100K+ tests per day

[Ellume](#); [AARP](#); [Abbot](#); 3. [Fierce](#); [Lucira](#); [Insider](#); [Pixel](#); [Cue](#)

VACCINATION POLICY VARIES ACROSS INDUSTRY AND CLASSIFICATION OF EMPLOYEES

Employers largely will avoid mandating vaccines apart from a select few



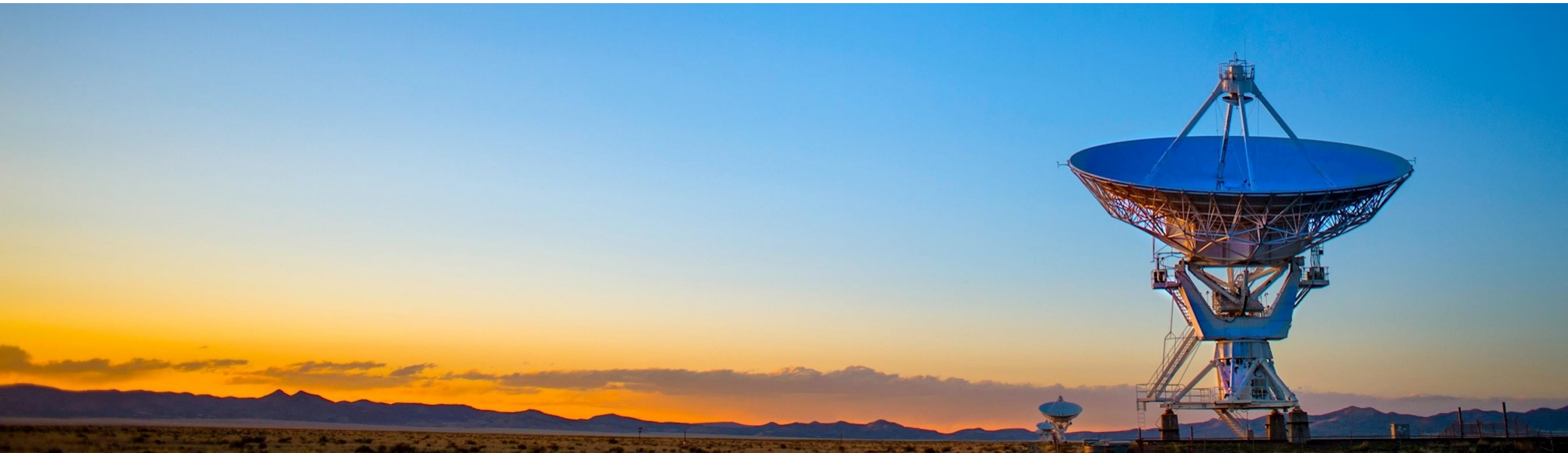
Considering Part of today's plan

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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