

COVID-19 Update

100 DAYS AND COUNTING

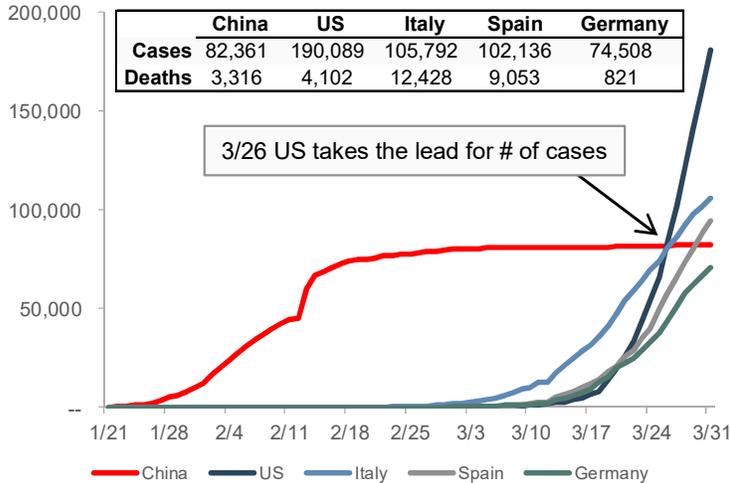
April 1, 2020

Expected Timeline and Economic Impact of COVID-19

Confirmed cases - What do we know?

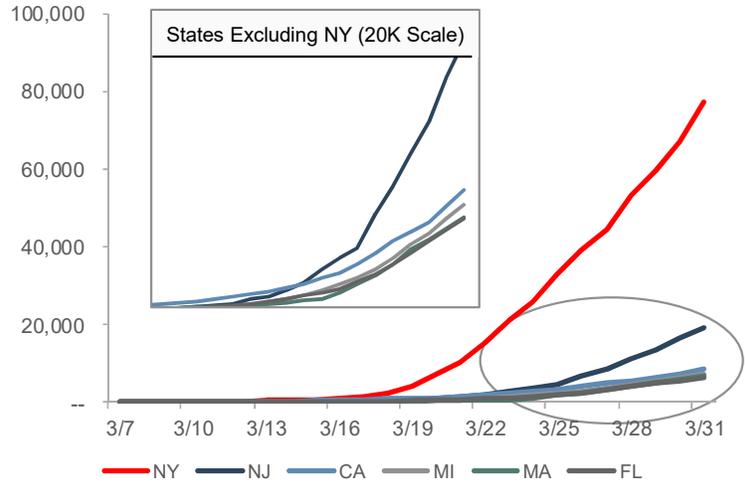
Confirmed Worldwide Cases

Despite skepticism around data reporting, China appears to have contained the virus to a single epicenter, reaching a quick plateau while the US and Europe battle prolonged exponential growth in cases and economic shutdown.



Confirmed US Cases

Forecasted mortality rates in the US have been recently moving down with the most recent estimate of 0.66% of confirmed cases. A gradual re-opening of the US economy in the near-term hinges on the success of mitigation strategies.



Timeline – What do we expect?

- New York, America's COVID-19 epicenter, is expected to reach peak cases by mid next week (week of 4/5), and we expect a sequential epidemic across the US as the virus rolls across other cities, extending peak US cases to end of April / early May
- Public health experts expect that deaths will peak at ~2,200 deaths per day on April 15th. They predict the death rate to fall to about 250 per day by June, but the death toll could mount into July (totaling 100,000 to 240,000 deaths in the US)

Potential US Hotspots



Timeline Scenarios

Positive Case: 40%

Return to normalcy by end of May as testing and treatments become widely available

Base Case: 40%

Return to normalcy by July as warmer weather helps slow the spread and treatments / testing become widely available

Negative Case: 20%

Government fails to take appropriate steps and no treatments become available, prolonging growth in cases and economic shutdown

Summary Economic Impact and Outlook – What do we expect? More Detailed Analysis Forthcoming in Follow-up Piece

- Post-shutdown recovery in China will be an important proxy for the rest of the world - with coal consumption and freight logistics running at ~85% and ~90% of normalized levels, the industrial part of the Chinese economy has recovered first
- Urban traffic at ~65% of normalized levels and companies such as YUM Brands, Starbucks and Montcler reporting sales are still down 20-50% point to a lagging consumer recovery
- While the Chinese economy shows tentative signs of recovery, albeit with unequal velocity across sub-sectors, a resurgence in COVID-19 cases and weak global demand will pose short-term risks; meanwhile, the crisis has also exposed the fragility of many underlying supply chains, creating a long-term risk of deglobalization for the export-heavy economy
- For the US – as a primarily service and consumer-driven economy vs. industrial economy in China – the main question is if the \$2.2T CARES Act will be enough to keep businesses afloat, stem job losses and regain consumer confidence
- To provide additional stimulus, President Trump called for a new infrastructure-focused spending bill worth \$2T
- The 3.28 million jobless claims and sharp decline in consumer sentiment put a v-shaped, consumer-driven recovery at risk
- As large and mid-sized businesses review their liquidity positions and small businesses evaluate their options from the relief bill, we believe we will have much more clarity on peak unemployment in the coming weeks

Progress on Ventilators, Testing and Personal Protective Equipment

Surging Demand for Ventilators

The American Hospital Association estimates that 5% of COVID-19 patients will need to be hospitalized, 40% of those patients would be admitted to an ICU and 50% of ICU admissions would require a ventilator, implying ~1% of all confirmed COVID-19 cases will end up on a ventilator. Estimated ventilator demand varies greatly from 260,000 to 960,000 given uncertainty surrounding the virus. However, with only 100,000 ventilators in the US, demand is clearly outpacing supply. The surge in demand has led traditional manufacturers to quickly ramp up production and invited new entrants to repurpose facilities to aid in the fight. The FDA has also loosened guidelines to allow for rapid scale-up. President Trump even invoked the Defense Production Act ordering General Motors to sharply ramp up production of ventilators. The Trump administration is looking to acquire up to 100,000 ventilators over the next 100 days as manufacturers scale up, though this is likely still shy of true demand.

Traditional Ventilator Manufacturers



Diversified Entrants Providing Aid



Clinical Testing Capacity and Testing Kits

Broad testing capabilities are paramount for early detection and minimizing further spread. South Korea, for example, currently has the capacity to manufacture 100,000 test kits a day and can indicate whether a person has COVID-19 within hours. In the US, it is estimated that a national capacity of 750,000 tests per week would be sufficient. Clinical labs have quickly expanded testing capacity and diagnostic companies have raced to receive approval for testing kits and scale manufacturing. Most notably, Abbott has developed a point-of-care test that will be able to deliver results in as little as 5 minutes. Expanded capacity across market participants is expected to reach the 750,000 tests per week threshold in the coming days.

Clinical Laboratories



Diagnostic Players



Personal Protective Equipment

The CDC recommends, at a minimum, N95 respirators for hospital staff expected to have direct contact with COVID-19 patients, plus disposable procedural or surgical masks for all other clinical personnel in any health care setting. The surge in cases across hard-hit cities in the US is creating shortages of personal protective equipment, placing frontline healthcare workers at risk of infection. Honeywell has started to hire at least 500 new employees to meet demand and 3M said it would increase investment to boost N95 mask production, while a slew of other companies from Brooks Brothers to Smile Direct, LVMH, Prada and Unilever have also pitched in to supply additional masks and other protective equipment.

COVID-19 Therapeutic Progress

The largest barrier to a broad re-opening of the US economy will be the validation of a therapeutic that can rescue patients with significant disease or prevent serious illness in those most at risk, or a safe and effective vaccine. Given the progress to date, focus across the pharmaceutical industry with 200+ trials and support from the FDA, we believe a treatment is likely to be validated in the next few months, allowing for broad re-opening by July/August, with a vaccine to follow in the next 12-18 months.

Potential treatments can be categorized in four ways (in order of importance relative to broad re-opening of the US economy):

- 1) Repurposing of existing anti-viral drugs for COVID-19 treatment
- 2) Repurposing of existing drugs to treat Inflammation and Acute Respiratory Distress Syndrome (ARDS)
- 3) New treatments and prophylaxis
- 4) Vaccines

(1) Repurposing of Existing Anti-Viral Drugs for COVID-19 Treatment

Remdesivir GILEAD Creating Possible

- Previously developed as a treatment for Ebola
- Phase 3 studies in China expected to report data in April; Gilead-sponsored studies expected to report data in May
- Compassionate use status for severe cases

Chloroquine / Hydroxychloroquine

- Used to treat malaria and inflammation
- Researchers in China and France reported improved outcomes in patients treated
- One study in patients with severe ARDS with a completion date of August 31, 2020
- Compassionate use status for severe cases

Avigan FUJIFILM

- Previously rolled out against Ebola and avian flu
- Recent report that clinical trials of the drug in China showed it effective against COVID-19
- Japan plans to begin trials of the drug and ramp up production with the aim of a quick approval

(3) New Treatments and Prophylaxis

Novel Multi-Antibody Cocktail REGENERON

- Dual-antibody cocktail targeting the SARS-CoV-2 spike protein (glycoprotein required for infection)
- Regeneron has isolated hundreds of virus-neutralizing antibodies and will select the top two antibodies based on potency and binding affinity
- Approach has been validated with successful treatment of Ebola Virus
- Testing expected to begin in early summer

Convalescent Plasma Therapy

- Convalescent plasma transfusion from recovered patients to infected patients demonstrated clinical improvement in a small study of 5 critically ill, COVID-19 patients with ARDS
- Limited sample size and study design preclude a definitive statement and scalability will be limited by donor availability

(2) Repurposing of Existing Drugs to Treat Inflammation and ARDS

Actemra Roche

- Used to treat severe rheumatoid arthritis
- Currently being evaluated in 4 studies in patients with severe COVID-19 pneumonia at risk of respiratory failure
- Nearer term study completion dates in May 2020 with longer dated studies extending 2021/2022
- Approved in China to treat severe cases

Kevzara REGENERON SANOFI

- Used to treat rheumatoid arthritis
- 400 patient phase 2/3 study actively recruiting hospitalized patients with severe COVID-19 in NYC
- Study completion date of March 2021

Sylvant EUSA Pharma

- Single observational study actively recruiting patients with ARDS and COVID-19 infection in Italy
- Retrospective comparison to matched controlled patients not receiving the drug
- Primary completion date of May 2020

(4) Vaccines

COVID-19 Vaccine Johnson & Johnson

- Selected lead candidate from constructs it has been working on since January 2020
- Expects to initiate clinical studies by September 2020
- Anticipates first batches of COVID-19 vaccine could be available for emergency use authorization in early 2021

mRNA-1273 Vaccine moderna

- Vaccine targeting the spike protein of the Coronavirus
- Dosed its first patient in a phase 1 study in healthy volunteers on March 16
- Study completion date of June 2021



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