Anatomy of an Outbreak: May 28, 2020
Lessons learned from a global pandemic
Today’s Research Experts

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Coronavirus cases in the United States
Current as of May 27, 2020

- At least 1,689,100 cases
- 368,669 cases in New York
- At least 100,000 deaths

Original estimates of possible effects
- 96 million cases
- 4.8 million hospitalizations
- 480,000 deaths

Worldwide daily death tolls slowly trending down

Daily coronavirus deaths (rolling 3-day average), by number of days since 3 daily deaths first recorded

<table>
<thead>
<tr>
<th>Country</th>
<th>Total deaths per million</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.K.</td>
<td>555</td>
</tr>
<tr>
<td>Italy</td>
<td>546</td>
</tr>
<tr>
<td>France</td>
<td>426</td>
</tr>
<tr>
<td>Sweden</td>
<td>403</td>
</tr>
<tr>
<td>U.S.</td>
<td>302</td>
</tr>
<tr>
<td>Germany</td>
<td>101</td>
</tr>
<tr>
<td>Russia</td>
<td>26</td>
</tr>
<tr>
<td>South Korea</td>
<td>5</td>
</tr>
</tbody>
</table>


Sharp drops in state deaths warrant cautious optimism
But progress may be counteracted as states reopen in early June

Daily coronavirus deaths (rolling 3-day average), by number of days since 10 total deaths first recorded


<table>
<thead>
<tr>
<th>Metro Area</th>
<th>Total deaths per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>668</td>
</tr>
<tr>
<td>Detroit</td>
<td>624</td>
</tr>
<tr>
<td>New York City</td>
<td>445</td>
</tr>
<tr>
<td>New Orleans</td>
<td>328</td>
</tr>
<tr>
<td>Miami</td>
<td>265</td>
</tr>
<tr>
<td>Chicago</td>
<td>173</td>
</tr>
<tr>
<td>Seattle</td>
<td>104</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>57</td>
</tr>
</tbody>
</table>

Almost all states taking steps towards reopening
With continued pressure for increasing testing from the White House

States re-opening status
*Current as of May 26th*

Excerpt

**Covid-19 Strategic Testing Plan**
*Trump Administration plan distributed to Congress*

“State plans must establish a robust testing program that ensures adequacy of Covid-19 testing, including tests for contact tracing, and surveillance of asymptomatic person to determine community spread. States must assure provisions are in place to meet future surge capacity testing needs including POC (point-of-care) or other rapid result testing for local outbreaks.”

No magic bullet to reopening strategies
Different states at different stages experiencing both rising and falling cases

Arkansas
Never had a stay-at-home order
7.0% of tests are positive (increasing)

Daily Covid-19 positive cases

<table>
<thead>
<tr>
<th></th>
<th>12-May</th>
<th>26-May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arkansas</td>
<td>85</td>
<td>180</td>
</tr>
</tbody>
</table>

Texas
No stay-at-home order for 27 days
5.5% of tests are positive (decreasing)

Daily Covid-19 positive cases

<table>
<thead>
<tr>
<th></th>
<th>12-May</th>
<th>26-May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>1,100</td>
<td>950</td>
</tr>
</tbody>
</table>

Maine
Stay-at-home order in place for 55 days
2.7% of tests are positive (increasing)

Daily Covid-19 positive cases

<table>
<thead>
<tr>
<th></th>
<th>12-May</th>
<th>26-May</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maine</td>
<td>37</td>
<td>53</td>
</tr>
</tbody>
</table>

Several factors influencing Covid-19 spread as states re-open
- Testing rates
- Social distancing
- Population density
- Weather
- Contact tracing
- Outbreak timing

Providers “Buy American” to mitigate supply chain risk
Third parties continue to play major role in facilitating more resilient supply chain

**Partnership details**

**Prestige Ameritech**
Located in Fort Worth, TX; Largest domestic manufacturer of PPE

**Premier Inc.**
Health care technology company and group purchasing organization

- Premier and 15 of its large health system members purchase minority stake in Prestige Ameritech
- Members commit to purchasing a portion of all face masks they use from Prestige Ameritech for up to six years
- Arrangement part of Premier’s broader strategy to invest in domestic and geographically diverse suppliers of PPE

**Benefits of partnership**

1. **Supply chain resilience**
   Domestic manufacturing and raw material sourcing creates a supply chain that is more resilient to shocks from overseas

2. **Contract guarantees**
   Investors are first in line to receive PPE in the event of a shortage

3. **Economies of scale**
   Combined purchasing scale alleviates increased spend associated with buying from domestic manufacturers

**Outstanding questions**

- Will providers’ appetite to bolster their domestic supply chain extend beyond PPE?
- Will providers revert back to valuing cost savings over supply chain resilience as memory of Covid-19 fades?

Government calls to move some drug manufacturing onshore
Potential move to mitigate drug shortages puts pressure on pharma

**BARDA**\(^1\) taps U.S.-based manufacturer to produce drugs and APIs\(^2\) for Covid-19

- Virginia-based **Phlow Corporation** awarded $354 million, four-year contract to manufacture generic drugs and APIs\(^2\) needed to treat Covid-19
- Includes collaboration with private-sector, U.S.-based drug and chemical manufacturing companies

**Partnership goals:**

1. Allow U.S. to manufacture essential drugs at risk of shortages
2. Create “strategic active pharmaceutical ingredient reserve” to prepare for drug shortages or emergencies
3. Reduce reliance on drug products and active ingredients manufactured overseas

**Policymakers talk of shifting even more pharma manufacturing to U.S.**

- Rumored Federal executive order could mandate government agencies (e.g., VA) to purchase exclusively American-made pharmaceuticals
- Lawmakers have introduced ~20 bills to overhaul the drug supply chain since beginning of Covid-19

**Possible implications:**

- Increased prices of drugs and active ingredients
- Complications and delays in existing supply chain
- Loosening of environmental regulations that currently hinder pharma manufacturing in the U.S.

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1) Biomedical Advanced Research and Development Authority.
2) Active pharmaceutical ingredients.

HHS allocates $4.9 billion for SNF Covid-19 response
Funding influx significant, but less than half of what the industry requested

Who is eligible to receive funding?
Certified SNFs with **six or more certified beds** are eligible for this targeted distribution.

What is the distribution methodology?
- **$50,000** Fixed amount per SNF
- **$2,500** Additional amount per bed

What is the additional criteria to receive funds?
Eligible facilities must comply with audit and reporting rules.

**$4.9 billion**
In Provider Relief Fund payments designated for SNFs

Funds can be used to:
- Scale up testing efforts
- Secure protective equipment
- Address staffing needs
- Reimbursce lost revenue

SNFs still need testing, PPE, and regulatory support

PPE and testing support
SNFs lack access to critical supplies, which are being distributed in an uncoordinated fashion.

79%
Senior and long-term care providers need better access to supplies

54%
Senior and long-term care providers need better access to testing

Continued funding sources
SNFs need additional funds to secure staff, better infection control, and unanticipated needs.

65%
Senior and long-term care providers report increased staffing challenges

$440 million
One-time cost of testing residents and staff, AHCA estimates

A unified regulatory approach
Lack of clarity regarding regulations is an obstacle to Covid-19 response.

“[We need] consistent unified information and regulatory direction that doesn’t differ from government and oversight entity to entity.”
Anonymous Senior Living executive

Source: Advisory Board interviews and analysis.

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Did anyone get close to herd immunity?
Spain’s national antibody survey shows hardest hit countries still far from it

CASE EXAMPLE
Carlos III Institute for Health, National Statistics Institute
Spanish equivalent of the US N.I.H.

- Conducted national antibody testing (IgG) survey of 70,000 citizens in partnership with the national statistics institute
- Samples obtained from randomly selected households (36,000) across all provinces
- Results show significant regional differences in positivity rate (1.1%-14.2%)
- Despite having third highest Covid death rate in Europe, study findings indicate that nationally only 5% of Spaniards have been infected with the SARS-CoV-2 virus

Estimated ‘immunity’ differs across Spanish provinces

CASE EXAMPLE

Jaén: 3.6%
Madrid: 11.3%
Soria: 14.2%
Barcelona: 7.1%

Spain’s estimated national rate of ‘immunity’ 5%

Source: Financial Times “Spanish herd immunity is still far off, study finds”; Catalan News “Study reveals 7.1% of Barcelone residents have Covid-19 antibodies”.

Advisory Board interviews and analysis.
Comparing Covid mortality across countries quite tricky
Excess mortality paints more accurate picture than Covid-19 deaths

Explanations for data discrepancies emphasize need for caution

No universal death count methodology
- While Belgium always counted Covid deaths in nursing homes, the UK and US didn’t until April

Covid-19 often under- or misdiagnosed
- Lack of pathologists in the US means not all deaths at home have been tested for Covid-19
- Doctors who make final decision may have different thresholds for what is a Covid-19 death
- Raw Covid-19 death count often doesn’t take into account deaths caused by delayed care

Demographics can skew death count
- Singapore’s low Covid-19 death rate is partly due to its relatively young, migrant population

Excess deaths and COVID deaths per jurisdiction
All values in thousands

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Excess Deaths</th>
<th>COVID Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>59</td>
<td>45</td>
</tr>
<tr>
<td>Spain</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>France</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>Italy</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>New York City</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>Netherlands</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Belgium</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Germany</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sweden</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Istanbul</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

In the UK, 77% of excess deaths attributed to Covid
In Belgium, all excess deaths attributed to Covid, including those in nursing home


1. Death count starts after the first 50 COVID-19 deaths in each jurisdiction and is current as of May 17, 2020. Excess deaths is the difference between total deaths and expected deaths, as compared to a five-year average.
Was there a “secret sauce”?  
Three key pandemic response ingredients in countries with lower rates

<table>
<thead>
<tr>
<th>Pre-baked pandemic response policies and protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since MERS in 2015, <strong>South Korea</strong> has:</td>
</tr>
<tr>
<td>• Given its KCDC greater decision-making authority to respond to outbreaks</td>
</tr>
<tr>
<td>• Revised data privacy laws to prioritize social security over individual privacy at times of infectious disease crises</td>
</tr>
<tr>
<td>• Amended its Medical Device Act to establish an emergency use authorization policy</td>
</tr>
<tr>
<td>• Created a legal framework for how central and local governments would cooperate and make decisions during a crisis</td>
</tr>
<tr>
<td>• Created an Office of Risk Communication to provide public guidance on how to identify untrustworthy information during a crisis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Near-immediate quarantine steps taken</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
</tr>
<tr>
<td>Czech Rep.</td>
</tr>
<tr>
<td>Portugal</td>
</tr>
<tr>
<td>Austria</td>
</tr>
<tr>
<td>France</td>
</tr>
<tr>
<td>Spain</td>
</tr>
<tr>
<td>Italy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data visibility into how the virus moves</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
</tr>
<tr>
<td>Singapore, Taiwan, and Hong Kong</td>
</tr>
<tr>
<td><strong>Types of surveillance data (incl. GPS location, credit card records, CCTV footage) used to aid contact tracing in South Korea</strong></td>
</tr>
<tr>
<td><strong>345</strong> Confirmed Covid-19 cases in Singapore before they rolled out <strong>TraceTogether</strong>, the national Covid-19 contact tracing app</td>
</tr>
</tbody>
</table>

How is disease monitoring being implemented elsewhere?

The Western Hemisphere is entering its contact tracer hiring sprint

Global contact tracing app development sheds light on digital shortfalls

Privacy concerns limiting app uptake
Apps are opt-in only, leaving most countries far short of the 60% adoption rate necessary for them to be effective

Bluetooth proving to be a shaky technology
Older phones lack BT tech, and signal is not always reliable; particular blind spot for the world’s senior population

Stand-offs with private industry delaying app releases
Google and Apple’s decentralized protocol derailed several national apps, including the EU-wide app led by Germany; Proving to be an ongoing sticking point in other countries

Too many apps creating a coordination problem
Dozens of apps within single geographic areas will spread contact data across the various tools

Double down on surveillance
- Singapore

Double down on manual tracing
- Germany
- Spain
- US
- Canada
- Italy
- UK

184k Contact tracers necessary to safely reopen the US economy, estimated by George Washington School of Public Health

Covid-19 gave us a playbook on how to flex up bed supply

Government responses yielded unprecedented increases in acute and critical bed supply, availability

<table>
<thead>
<tr>
<th>Measures taken in Ontario, Canada between 15 March and 14 April</th>
<th>Acute beds</th>
<th>Critical care beds</th>
<th>Critical care beds w/vent.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital efforts to free up existing capacity (including canceling elective surgeries)</td>
<td>+6,849</td>
<td>+585</td>
<td>+583</td>
</tr>
<tr>
<td>Moving hospital patients to other locations</td>
<td>+1,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Newly funded beds</td>
<td>+1,500</td>
<td>+500</td>
<td>0</td>
</tr>
<tr>
<td>Other expansion of critical care capacity</td>
<td>0</td>
<td>+992</td>
<td>0</td>
</tr>
<tr>
<td>Additional ventilator deployment</td>
<td>0</td>
<td>0</td>
<td>+1,492</td>
</tr>
<tr>
<td>Available beds in province prior to outbreak</td>
<td>906</td>
<td>357</td>
<td>356</td>
</tr>
<tr>
<td><strong>Total additional beds made available</strong></td>
<td><strong>+9,349</strong></td>
<td><strong>+2,077</strong></td>
<td><strong>+2,075</strong></td>
</tr>
<tr>
<td>Beds occupied by Covid-19 patients</td>
<td>-910</td>
<td>-243</td>
<td>-193</td>
</tr>
<tr>
<td>Net increase in available beds in province (% increase in parentheses)</td>
<td>+9,345 (+1,032%)</td>
<td>+2,191 (+482%)</td>
<td>+2,238 (+483%)</td>
</tr>
</tbody>
</table>

1. As of 14 April 2020.
2. In February 2020 England has 4,122 critical care beds.

**DATA SPOTLIGHT**

800

Critical beds Italy added in two weeks by halting electives and converting semi-intensive care beds

4,000

Critical care beds in London’s NHS Nightingale field hospital, which doubled England’s total critical care bed supply in just 10 days²

PPE remains the global rate limiting factor

“Canada facing ‘major’ medical gear shortage as 68 countries restrict exports”
Financial Post

“How a lack of PPE in Spanish hospitals is leading to a health care crisis”
The Irish Times

“We’re not hungry, we need masks’ says Australian doctor on coronavirus frontline”
Reuters

“London [hospitals] to ‘run out of gowns this weekend’”
HSJ

Excerpt

Shortage of personal protective equipment endangering health workers worldwide

The World Health Organization has warned that severe and mounting disruption to the global supply of personal protective equipment (PPE)…is putting lives at risk from the new coronavirus and other infectious diseases.

…shortages are leaving doctors, nurses and other frontline workers dangerously ill-equipped to care for COVID-19 patients, due to limited access to supplies such as gloves, medical masks, respirators, goggles, face shields, gowns, and aprons.

World Health Organization

Source: HSJ “Trusts to Run Out of Gowns” WHO “Shortage of Personal Protective Equipment Endangering Health Workers Worldwide”; Financial Post “Canada Facing Major Medical Gear Shortage”; Reuters “We’re Not Hungry We need Masks…”; “IrishTimes “How a Lack of PPE is Leading to a Healthcare Crisis.”
Restarting planned procedures around the world

**Norway:** Hospitals to return to ‘normal’ operations beginning 2 June

**United Kingdom:** Hospitals resumed some planned procedures where capacity allowed; cardiac and A&E numbers almost back to ‘normal’

**United States:** Planned procedures resumed in ~40 states; rescheduling criteria often based on MeNTS¹ scores

**Australia:** NSW² and Victoria resumed 50% of surgeries; SA³ resumed 100%; other states between 50-100%

**Denmark:** Hospitals resumed non-critical procedures for non-Covid-19 patients and private hospitals and clinics opened on 20 April

**Israel:** Elective procedures, surgeries and outpatient treatment resumed on 30 April; morning surgeries at 60% capacity, afternoon at 50%

**New Zealand:** Planned care, including elective surgery and radiology, will be provided in order of clinical priority from 13 May

**Divergence in which procedures reopening first**

**United States**⁴

- Inpatient joint replacement
- Elective EP⁵ and angioplasty
- Gastrointestinal surgery for stable patients
- Outpatient orthopedic procedures

**Australia**

- Joint replacements (including knees, hips, shoulders)
- Post cancer reconstruction procedures (such as breast reconstruction)

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1. Medically Necessary, Time Sensitive.
2. New South Wales.
3. South Australia.
4. Common procedures that US systems are choosing to start with.
5. Electrophysiology.

<table>
<thead>
<tr>
<th>Disease penetration (deaths per million)</th>
<th>Singapore</th>
<th>Australia</th>
<th>South Korea</th>
<th>Germany</th>
<th>US</th>
<th>Sweden</th>
<th>Italy</th>
<th>UK</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td>App uptake at ~25%; citizens must scan ID or QR code for entry to most public places</td>
<td>3.93</td>
<td>4.00</td>
<td>5.25</td>
<td>99.65</td>
<td>298.00</td>
<td>408.43</td>
<td>545.06</td>
<td>545.74</td>
<td>579.99</td>
</tr>
</tbody>
</table>

| Digital contact tracing | Initial: Strict quarantine for those exposed; social distancing for others | Current: In re-opening phase 1 of 3: most schools open; retail shops open; dine in restaurants allowed for at most 10 patrons at a time | Current: In re-opening phase 1 of 3: most schools open; retail shops open; dine in restaurant service for at most 10 patrons at a time | Initial: Moderate stay at home orders; more strict measures at state/territory level | Initial: Moderate stay at home orders; more strict measures at state/territory level | Initial: Moderate stay at home orders; more strict measures at state/territory level | Initial: Moderate stay at home orders; more strict measures at state/territory level | Initial: Moderate stay at home orders; more strict measures at state/territory level | Initial: Moderate stay at home orders; more strict measures at state/territory level |

| Social distancing and quarantine measures | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level | Initial: Moderate quarantine at home orders; more strict measures at state/territory level |

| Initial government economic support | Health care: Govt paying all Covid-19 bills in public hospitals | Health care: Govt bought public access to 34,000 beds in private hospitals | Health care: Initial stimulus funding provided to medical institutions | Health care: €2.8B to hospitals to cushion loss of revenue | Health care: $180B to hospitals and health care sector | Health care: SEK 22B added to 2020 budget for health care and social services | Health care: €3.2B for ICU expansion, increased staffing costs, PPE costs | Health care: £10B to NHS; £13.4B hospital and CCG3 debt written off | Health care: €2.8B to regional govt's for public hospitals, €1B to Ministry of Health |

| Planned procedures | Stopped as caseload increased in mid-April | Planned procedures never fully stopped | Planned procedures never fully stopped | Planned procedures never fully stopped | Planned procedures never fully stopped | Planned procedures never fully stopped | Planned procedures to resume soon | Private hospitals resuming planned procedures; public to follow soon | Planned procedures to resume soon |
What we’re hearing from the global membership

What is the world doing to prepare for wave two?

1. Bolstering urban preparedness
   - Establishing “hot” and “cold” sites for future access
   - Hardwiring infection control protocols with all provider partners

2. Setting up “circuit breakers”
   - Codifying metric threshold breach that initiates return to outbreak management (i.e., $R_0$ or infection rate trends)

3. Surveilling ‘at-risk’ sites and populations
   - Identification of existing, at-risk patients who need added shielding and psycho-social support
   - Outreach to businesses with large, centralized workforce(s)

4. Ramping up contact tracer workforce
   - Public health hiring tens of thousands of manual contact tracers to prevent and/or respond to second waves
   - Hospitals creating in-house contact tracing teams for Covid-positive patients and staff

5. Watching the southern hemisphere
   - Monitoring developments in Australia and New Zealand as they enter their winter and flu season
The top 16 open questions we’re looking at now
Executive discussion presentation available to all health care organizations

How will Covid-19 impact…

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>…the demographic makeup of the US—and future demand?</td>
<td>…the purchaser landscape and the nation’s payer mix?</td>
<td>…the competitive landscape efforts to “disrupt” the industry?</td>
<td>…expectations about U.S. health care capacity?</td>
</tr>
<tr>
<td>…site-of-care shifts, including to virtual channels?</td>
<td>…perception of government’s role in health care?</td>
<td>…public perception of industry stakeholders?</td>
<td>…the structure of the U.S. health care supply chain?</td>
</tr>
<tr>
<td>…demand for behavioral health services?</td>
<td>…employers’ health benefits strategies?</td>
<td>…future fundraising and philanthropy efforts?</td>
<td>…the future of the clinical workforce?</td>
</tr>
<tr>
<td>…the U.S.’ approach to post-acute and long-term care?</td>
<td>…the future of value-based care and risk-based payment?</td>
<td>…perceptions of the value of systemness and scale?</td>
<td>…the pharma, device, and tech innovation pipelines?</td>
</tr>
</tbody>
</table>
Your top resources for COVID-19 readiness

**CDC and WHO Guidelines**
Compiles evidence-based information on hospital and personnel preparedness, COVID-19 infection control recommendations, clinical guidelines, and case trackers.

**Coronavirus scenario planning**
Explores twelve situations hospital leaders should prepare for and helps hospital leadership teams pressure test the comprehensiveness of their preparedness planning efforts and check for blind spots.

**Managing clinical capacity**
Examines best practices for creating flexible nursing capacity, maximizing hospital throughput in times of high demand, increasing access channels, deploying telehealth capabilities, and engaging clinicians as they deal with intense workloads.

**How COVID-19 is transforming telehealth—now and in the future**
Explores how telehealth is being deployed against COVID-19 and essential next steps for telehealth implementation.

To access the top COVID-19 resources, visit [advisory.com/covid-19](http://advisory.com/covid-19)
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