Health system preparedness: Global COVID-19 views on resolve and return

Compendium

June 2020

Solving the humanitarian challenge is the top priority. Much remains to be done globally to prepare, respond, and recover—from protecting populations at risk to supporting affected patients, families, and communities to developing a vaccine. To address this crisis, countries will need to respond in an evidence-informed manner, leveraging public-health infrastructure and proactive leadership.

This document is meant to provide a summarized fact base on COVID-19 resolve and return perspectives from around the world, identifying how global health systems have approached various COVID-19 topics such as testing, tracing and more

In addition, we have developed a broader perspective on implications for businesses across sectors that can be found here: https://www.mckinsey.com/business-functions/risk/our-insights/COVID-19-implications-for-business**.** This supplemental material discusses implications for the wider economy, businesses, and employment; and sets out some of those challenges and how organizations can respond in order to protect their people and navigate through an uncertain situation.

Topics and key questions for global COVID-19 views

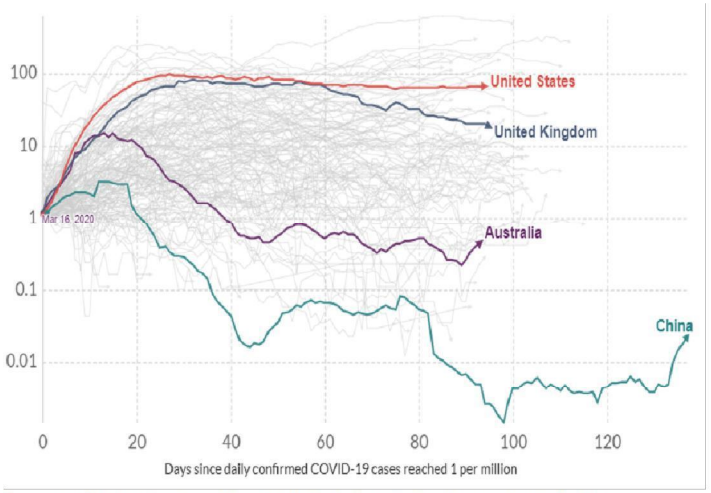
	Topics		Key questions
Public health	Testing	A	▪ **What actions** did governments and providers take to scale up testing capacity? ▪ What actions are governments currently to sustain testing delivery? ▪ **What is the current testing process** (location, method, frequency)? ▪ **What has been the approach** by the government and private sector to **PCR, antibody, antigen and serology testing?**?
	Tracing	B	▪ **Which approach to contact tracing** (physical/digital) has the highest utilization? – What are the **benefits and challenges** of this approach? – What **capabilities and resources** are required? (workforce, technology, outreach & adoption, etc.) ▪ **How many contact tracers are required?** (using different methodologies) ▪ **What measures have been taken** to protect citizen **data and privacy**? ▪ **What do governments offer** to individuals who voluntarily quarantine?
	Supply chain	C	▪ **What actions** did governments take to **prevent future supply shortages**? – **How has the size of stockpiles changed** or planned to change? – **Which reuse / reprocess protocols** have been adopted? – **Has the government established transparency** into supplies across facilities? If so, have supplies been reallocated across sites?
	Clinical and workforce data	D	▪ **How do different governments track healthcare data**? (e.g., hospital beds, COVID-19 cases, inventory, etc.) ▪ **What is the frequency** with which governments collect data? Do other governments have real-time data sources? ▪ **How do governments use this data** to make decisions? What are some examples?
	Vulnerable populations	E	▪ **What measures** have been taken to **safeguard the health of the elderly persons, persons experiencing homelessness, and indigenous communities**?
Provider	Elective volumes	F	▪ **Which countries halted elective procedures**? What did other countries do that did not limit volume? ▪ **What processes and protocols** are countries putting in place as they restart elective procedures? ▪ **Which service lines** are being restarted first? ▪ **What are the trends in volume return and consumer confidence** across patient populations, sites, and procedure types? ▪ **What is the role of government versus the private sector** in cancelling or postponing elective procedures?
	Telehealth	G	▪ **What was the share of activities performed via telehealth** before COVID-19? **Which were converted to telehealth** during COVID-19? ▪ **How has telehealth utilization changed** as COVID-19 cases have declined? ▪ If governments introduced measures and incentives to encourage uptake of telehealth, **are these policies still in place**?
	Workforce burnout	H	▪ **What measures** did governments and providers introduce to **mitigate the effects of burnout across the clinical workforce**?

Key themes for public health

Countries around the world have seen varying results in controlling COVID-19 spread

Results are driven by many variables, with several key themes emerging across public health approaches

Daily confirmed COVID-19 cases per million



Source: Our World in Data; data as of June 17, 2020; note that estimates of cases vary based on testing

Testing

- Countries demonstrated one of three archetypes:
  - Rapid testing and high initial restrictions to economic and social activities
  - Widespread testing of people with and without symptoms along infection chains
  - Restricted testing strategy focused on diagnosing patients with symptoms (least effective)

Tracing

- Governments with existing contact tracing workforce and infrastructure – particularly those with past pandemic experience – have more rapidly implemented their COVID-19 contact tracing efforts; however some countries have still had success ramping up even without pre-existing capabilities
- Public health systems have traditionally led contact tracing, but others are getting involved, including private technology players

Supply chain

- Countries generally faced shortages of national reserves in addition to a lack of pre-established demand management protocols – many countries sought to boost reserve supply or introduce protocols after their first confirmed COVID-19 case
- Some nationalized health systems were also able to better allocate supply across geographies through shared supply chains and centralized control of inventory allocation

Clinical and workforce data

- Some governments with comprehensive data sets on bed capacity, hospitalizations and inventory were better able allocate health system capacity across providers
- Many data sets were in place before the pandemic and have continued past the peak; however, without real-time data, governments innovated new ways to capture more frequent data, including regular data submissions mandated from providers

Select key themes shown; additional detail (incl. on vulnerable populations) follows

A Testing

Key themes

1. Countries demonstrated one of three archetypes:
   - Rapid testing and high initial restrictions to economic and social activities
   - Widespread testing of people with and without symptoms along infection chains
   - Restricted testing strategy focused on diagnosing patients with symptoms *(least effective)*
2. Speed matters: The countries with the greatest success in limiting the spread of COVID-19 ramped up testing capabilities early (i.e., countries with restricted testing strategies have had worse outcomes to date)
3. Governments with limited testing capacity have sought more targeted approaches to testing, though underestimating asymptomatic cases
4. In some countries, confusion around testing availability has impacted consumer confidence (e.g., consumers perceive shortages)

Open questions

1. How should testing archetypes evolve as nations return to normal? What is the right approach to testing given local circumstances?
2. What are the implications of positive serology tests for patients? (i.e., do tests mean they are protected from future illness, and if so, for how long?)
3. What is the role of "immunity passports" in a post-COVID-19 world?

A

Countries have adopted one of three testing strategies depending on their capacity for testing

Approach	1 Rapid testing and high initial restrictions to economic and social activities	2 Widespread testing of people with and without symptoms along infection chains	3 Restricted testing strategy focused on diagnosing patients with symptoms
Examples	China, South Korea, Taiwan, Singapore	Germany, Norway, Iceland, Israel	France, Netherlands, UK, Sweden, United States
Resourcing	Large supplies of testing material internally (made) available, quickly sourced and development of new tests	High production of tests (with supply issues). In additional to regular PCR testing, use of drive throughs, home-testing; testing and through pods	Shortage of testing materials (in some countries, e.g., the U.S.), reliance on few suppliers Lack of systems to perform swabs, process tests, and release reports (e.g., U.K.) Need for future immunity testing, or major increase in testing capacity, to exit lockdowns.
Other measures in place	Wide temperature screening at checkpoints, quarantining people coming from risk areas abroad, strict physical distancing and isolation, supported by new IT (such as geo-tracking apps for physical distancing) and legislative measures to enforce measures	Physical distancing measures and different degrees of intelligent lockdowns	Different degrees of ongoing (intelligent) lockdowns and social isolation
Preliminary results	Effective triage and curbing of increase in cases. Some challenges in suppressing subsequent outbreaks, e.g., Singapore, S Korea	Relatively high number of cases coupled with low morbidity rates due to high testing rate	Increase in cases (systematic underestimation of total amount), differences in extent to which curve is flattening
Societal impact visible	After initial stillstand, economic (and to lesser degree social) activities slowly resume	Increase in knowledge about COVID-19 spread and characteristics, continuing (self) isolation measures where necessary	Continuing (self)isolation measures amidst unclarity, economic and social standstill, pressure to increase testing

A

1: China testing overview (rapid testing and high initial restrictions to economic and social activities)

RISK REVIEWED

Testing statistics[1]

- More than 1.5M nucleic acid tests conducted per day:
  - Hubei: 1m/day
  - Heilongjiang: 90k/day
  - Wuhan: 70k/day
  - Guangdong: 60k/day
- >5m testing kits manufactured per day

Segmentation and goal of testing

Communities around clusters. All international travellers. Individuals returning to work and school. Everyone inside Wuhan city.

Contact tracing policy

Regional Health code, Telegram carrier tracking, Epidemic map

Status of testing

Confirmed case: suspect cases with one of the following etiological or serological evidences:

- Real-time fluorescent RT-PCR indicates positive for new coronavirus nucleic acid;
- Viral gene sequence is highly homologous to known new coronaviruses;
- COVID-19 specific IgM and IgG antibodies are detected positive in blood serum; COVID-19 specific IgG antibody is detected positive or increases at least four-fold during convalescence compared with the acute phase

Testing protocol

Conduct tests for wider public, mandatory test for intl. travellers.

Future focus

Wuhan has finished city-level public test. Thousands of temporary testing sites are set up in the neighborhoods; ~10M people were tested in 17 days with no confirmed case. Asymptomatic carrier cases are 3.03 per 1000 population. The tests are increasing available to the wider public. Digital platforms (e.g., Alibaba, JD) collaborate with health providers and testing kit providers. People can make online COVID-19 test appointments.

Innovation techniques

Locking down entire severe areas (intense travel restrictions, prevent public gatherings). Temperature checks at multiple check points in public spaces

Opening up fever outpatient departments in hospitals, designating COVID-19 specialty hospitals and building temporary speciality hospitals

Receiving and curing all confirmed cases; mild patients are separately treated in temporary shelter hospitals and moderate-severe patients are treated in COVID-19 specialty hospitals

Retooling factories to make face masks and other PPEs

Takeaways

Test and isolate all suspected cases, incl. intl. travellers

Receive and cure all confirmed cases

Strict implementation of isolation and diagnosis policies

Retooling of existing manufacturing facilities to produce medical supplies

Country strength

Strength and scale of local manufacturing, life sciences and digital health sector

Sufficient national support to severe areas

Major exporter of PPE and equipment, supplying ~200 countries with >70B masks, 225M testing kits, and ~100,000 ventilators

Source: Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia, Trial Version 7, Press search, McKinsey analysis
1. Best available data

Updated 12th June
RISK REVIEWED

A

2: Germany testing overview (widespread testing of people with and without symptoms along infection chains)

Testing statistics[1]

56.5 tests / thousand population

Total 4.69M tests completed

21.6 tests per confirmed case

Segmentation and goal of testing

Testing according to RKI protocol

Federal state efforts[2] for comprehensive testing in nursing homes

Outbreak-based tests e.g., in butcheries

Contact tracing policy

Tracing by local health authorities, RKI containment scouts and Armed Forces

App expected in mid-June

Status of testing

Mostly PCR; other nucleic acid amplification methods reimbursable since May

Antibody testing in scientific studies; reimbursable but rare in outpatient care

Capacity: Daily testing capacity: ~169k

Testing options: i) outpatient clinics & hospitals, and ii) pooled local solutions e.g., drive-thrus

Testing protocol

i. Acute respiratory symptoms of any severity or loss of sense of smell/taste

ii. All potential COVID-19 symptoms and close contact with confirmed case in last 14 days

iii. Clinical or radiological evidence of viral pneumonia and association with an accumulation of pneumonia in care institutions / hospitals

Future focus

Antibody testing became reimbursable in May and may expand

Rapid testing push from private manufacturers e.g., Bosch with rapid test in April; no reimbursement

Directive to expand testing of asymptomatic patients on expense of SHI has been passed and large scale rollout is expected

Innovation techniques

- Early and extensive testing, since first cases detected in Jan
- Tests are not done inside hospitals, but rather in tents set up in front of hospitals (patients do not walk into the hospital unless they need intensive care)
- Patient to call central outpatient care hotline instead of going to a provider directly

Takeaways

Faster regulatory processes for assessing and approving tests developed by private companies could support rapid scale-up of testing capacity

Country strength

State-level healthcare decision-making (lack of centralised regulatory body) supported rapid development & mass production of tests by private companies

Source: RKI; Ministry of Health, Expert interviews
1. At 12 June 2 e.g., in the federal states of Saarland, Baden-Wurttemberg, Mecklenburg-Western Pomerania

TESTING

Updated 11th June
RISK REVIEWED

A

3: United States testing overview (restricted testing strategy focused on diagnosing patients with symptoms)

Testing statistics[1]

68 tests per 1,000 population

18 daily tests per confirmed case (average for latest week)

22 million tests completed

Segmentation and goal of testing

CDC guidance prioritizes healthcare workers & hospitalized patients with symptoms, but many states have expanded testing to asymptomatic people as well.

Contact tracing policy

CDC released a COVID-19 Case Investigation & Contact Tracing Plan, that involves mass hiring efforts, training, and lab services

Status of testing

PCR testing: Authorized Antigen Testing on May 9th

Antibody testing: Antibody testing launched across states and private organizations

Capacity: Daily testing capacity: 300k

Testing options: i) outpatient clinics & hospitals, and ii) pooled local solutions e.g., drive-thrus

Testing protocol

Many states are allowing testing for all residents, even those who are asymptomatic (Kentucky, Tennessee, New Jersey, etc)

However, in instances of testing shortages- the tests will be reserved for high-risk populations

Future focus

Department of HHS, in partnership with the CDC, will be delivering over $10B in funding to US states to support testing

Government plans to hire 60,000 + contact tracers or "disease detectives" by end of May

States (starting with NY) have begun manufacturing their own testing kits

Innovation techniques

Scientists are working with the FDA to get a new tool approved- a CRISPR-based system known as Detectr that could detect the disease in under 40 minutes.

Apple and Google launched an API enabling contact tracing apps that will notify users if they've been close to a COVID-19 + person.

Takeaways

The government is supporting testing with generous funds, however, the public health system is still overwhelmed, and strict leadership and oversight will be required with the help of a panel

Country strength

Funding and the expansion of testing to asymptomatic folk has paved a way for improved testing in the country. States have begun to be proactive in administering tests.

1. At 11th June

Source: https://www.cdc.gov/coronavirus/2019-ncov/downloads/php/health-department-checklist-final.pdf ; https://www.cdc.gov/coronavirus/2019-ncov/downloads/priority-testing-patients.pdf ; https://www.cnet.com/health/can-you-get-tested-for-coronavirus-right-now-heres-who-qualifies/ ; https://www.cdc.gov/coronavirus/2019-ncov/php/open-america/contact-tracing.htmlhttps://www.fda.gov/news-events/press-announcements/coronavirus-covid-19-update-daily-roundup-may-4-2020 ; https://www.vox.com/2020/5/14/21257264/coronavirus-testing-positive-rate-covid-reopen-usa ; https://www.hhs.gov/about/news/2020/05/18/hhs-delivers-funding-to-expand-testing-capacity-for-states-territories-tribes.html ; https://www.healthcaredive.com/news/apple-google-covid-19-contact-tracing-software-released/578350/

B Contact tracing

Key themes

1. Governments with existing contact tracing workforce and infrastructure – particularly those with past pandemic experience – have more rapidly implemented their COVID-19 contact tracing efforts; however some countries have still had success ramping up even without pre-existing capabilities
2. Public health systems have traditionally led contact tracing, but others are getting involved, including private technology players
3. Some countries have deployed tech-enabled tracing through apps, particularly those with greater central government control and fewer privacy regulations
4. However, technology has not been proven to be a replacement for a contact tracing workforce – all countries studied leverage manual contact tracers
5. Self-isolation protocols vary globally, with some governments mandating self-isolation for contacts and others providing voluntary guidelines

Open questions

1. Contact tracing is traditionally led by the government – what is the role of the private sector in collaborating with governments?
2. Can technological solutions be effective under governments which have opt-in contact tracing programs?
3. How do contact tracers effectively reach people, especially after lockdown ends?
4. How effective is manual contact tracing given its reliance on memory?

TRACING

B Comparative view of contact tracing – US only

As of May 7; Data collected prior to April 30

Note – data is rapidly changing & is non-exhaustive

Considerations for implementation

● App developed ✓ App being developed ○ Proposed only

Region	Location	Key stakeholders	Contact identification methods: Patient interviews	Apps: Used	Apps: Details	Other methods	Outreach channels	Contact tracing workforce: # of people*	# / 100K population	Budget (USD)	$ / 100K population	Isolation & quarantine methods	Enabling measures
North America	US – experts proposal	Proposal only - 16 key health experts are urging Congress to provide funding for contact tracing	✓	TBD	TBD	TBD		180,000	~54	~12B	~3.6M	14 day voluntary self-isolation	$50 a day payment for isolation Hotels for people who need isolation space
	Massa-chusetts	Run out of Gov. Office; with HHS, Insurance Connector, & Partners in Health (nonprofit) supporting with staff; Accenture & Salesforce support	✓		A back-end system is being used; applications being considered	N/A	Phone / text	1,000[2]	~15	~44M	~0.6M	Home isolation (exact details not specified publicly)	Care resource coordinators provide supportive resources No penalties / fines announced
	San Francisco	Joint partnership with Department of public Health, City, UC San Francisco, and DIMAGI (software)	✓		Working with DIMAGI on tech platform that supports texting	Team will also ask for permission to look at phone location data	Daily text messages / calls over 14 days	250[1]	~28	N/A	N/A	14-day self-isolation at home	Daily text messages / calls over 14 days 30+ RVs to be used for self-isolation of homeless individuals
	California	Run out of Gov. Office; Developing online based statewide training academy	✓	✓	Planning to deploy a symptom-check app	N/A	No details were announced	10,000	~25	N/A	N/A	Home isolation (exact details not specified publicly; may differ by counties)	By identifying regional alternate isolation sites and building private-public partnerships to support those who are isolated
	New York	State Health Department is working with Mayor Bloomberg, Johns Hopkins University and Vital Strategies	✓	✓	Back-end system; apps being considered	N/A	Phone calls	Up to ~6,400 - 17,000	~33 - 87[3]	10.5M+	~0.05M+[4]	Self-isolation or quarantine	State is broadening capacity for testing across the state
	Utah	Dept of Health leading contact tracing "surge"; implementation primarily led by local county health departments; Addtl support from Task Force, including Governor's Office, others[5]	✓	✓	Recently released Healthy Together symptom checking application	N/A	Phone / text (daily calls) Symptom/ location tracking app	1,200 Includes 20 soldiers from Utah National Guard	~37.5	N/A[6]	N/A	Voluntary 14-day self-isolation (but can be made enforced / made mandatory by local health departments) Tracers notify workplace of those infected / exposed	Health dept will check in daily for those in quarantine; Application enables connection to testing in the area and test results are available in the application

* Numbers typically do not include pre-existing workers in local public health departments

1. Trained as of 4/27 including librarians, UCSF med students, DPH staff 2. 1000 tracers plus ~75 case coordinators and 100-150 case investigators; Additional, 1,700 volunteers supporting; budget unknown 5. University of Utah, Dept of Public Safety, Board of Regents, Salt Lake Chamber of Commerce, and Intermountain Healthcare 6. Includes 2.7M for app development 3 Based on NY state pop 4. Only based on Bloomberg donation of $10.5M; full

Source: MA: Mass, MA: Talent boost; SF: Kron4, SF: SF mayor, SF, SF Chronicle, Technology Review: NY post, SF: Politico; UT: NPR; UT: Deseret; US proposal: The Hill; NY Gov; NY Gov update; Politico; Forbes; CNBC; UT: NPR; UT: Deseret, UT: Govt, UT: SL tribe

TRACING

B Comparative view of contact tracing (2/3)

Considerations for implementation

Note – data is rapidly changing & is non-exhaustive

As of May 7; Data collected prior to April 30

● App developed
✓ App being developed

Region	Location	Key stakeholders	Contact identification methods: Patient interviews	Apps: Used	Apps: Details	Other methods	Outreach channels	Contact tracing workforce: # of people*	# / 100K population	Budget (USD)	$ / 100K population	Isolation & quarantine methods	Enabling measures
Asia	Singapore	Ministry of Health leads program Others – including police, airlines, and transportation companies cooperate	●	●	Trace-Together app leverages Bluetooth ~1M downloads as of 4/1 (~18% of population)	Digital receipts (e.g., from Grab, an Uber-like service) CCTV surveillance	WhatsApp messages (2x / day) Phone call In-person visits	1,200[1]	~21	N/A	N/A	Mandatory 14 day self-isolation for close contacts Option of isolation at government facility	Testing is free; government pays healthcare costs of residents with confirmed / suspected cases Employers are prohibited from detracting quarantine days; self-employed people in receive payment Penalties for breaking isolation Contacts are required MoH
EMEA	Germany	Chancellery Minister Helge Braun and Health Minister Jens Spahn announced shift to decentralized model	●	✓	Shifting from centralized to de-centralized app	NA	Phone	N/A	N/A	N/A	N/A	N/A	N/A
	Iceland	Iceland's National Crisis Coordination Center leads program; Tracing team includes police detectives	●	●	Rakning C-19 app stores GPS location data; Government can request	N/A	Phone (calls, texts)	50	~3.7	N/A	N/A	Mandatory 14-day self-isolation	High per capita testing rate (~13% of population tested as of 4/28) Penalties for non-compliance Matching of location data from users of contact tracing app to the users' national IDs
	Ireland	Run by Health Protection Surveillance Centre (HPSC); Occupational Medicine dept monitors exposed HW workers; Infection Prevention and Control monitors inpatients	●	✓	CovidTracker Ireland App being developed (details not yet available)	N/A	Phone (calls, texts) In-person	>1,500	~82	N/A	N/A	Mandatory 14-day self-isolation at home Option of self-isolation facility in City West if referred by tracing team, PCP, or hospital	Health Act 1947 Section 31A regulations enable government to detain and criminally charge people who refuse to self-isolate
	Nigeria	Leveraging National Emergency Operations Centers & infrastructure	●	●	Mobile SORMAS platform	N/A	In-person interviews	1,000+	~0.5	N/A	N/A	TBD	The International Organization for Migration (IOM) is supporting health actors to construct 90 quarantine shelters across Borno, Adamawa and Yobe States

* Numbers typically do not include pre-existing workers in local public health departments 1. Based on discussions with experts in Singapore. In January, there were approximately ~1,200 tracers composed of Singapore Armed Forces (young adults serving mandatory 2 year service, full time National Service members, and police officers

Source:; SG: CDC, SG: BBC, SG: Business insider, SG: CNBC, SG: Straits times, SG: CNET, SG: Time, SG: Mothership; IS: Center for health security, IS: NBC news, IS: WSJ, IS: Hack a day, IS: Govt; IE: HPSC, IE: The star, IE: Irish examiner, IS: HSE, IS: Citizens information; Nigeria: AFRO WHO, press search

TRACING

B Comparative view of contact tracing (3/3)

Considerations for implementation

Note – data is rapidly changing & is non-exhaustive

As of May 7; Data collected prior to April 30

App developed
App being developed

Region	Location	Key stakeholders	Contact identification methods: Patient interviews	Apps: Used	Apps: Details	Other methods	Outreach channels	Contact tracing workforce: # of people*	# / 100K population	Budget (USD)	$ / 100K population	Isolation & quarantine methods	Enabling measures
EMEA	Norway	Norwegian Institute of Public Health leads the program	✓	✓	Smittestopp app leverages phone's location and Bluetooth	N/A	Phone (SMS)	N/A	N/A	N/A[1]	N/A	Mandatory 14 day home quarantine for close contacts	Fine of USD $2,000 or a 15-day jail sentence for anyone caught breaking home quarantine or home isolation rules
Oceania	Australia	Launched by the Australian government	✓	✓	COVIDSafe tracking app uses Bluetooth to identify close contacts	N/A	Phone (call)	N/A[2]	N/A	N/A	N/A	Mandatory 14 day quarantine	If a contact is required to go into isolation, some health districts have support services (e.g., daily SMS or call to check on symptoms and advise a test if need be)
	New Zealand	Ministry of health leads program	✓	✓	App being developed	N/A	Phone calls	190	~3.9	~24.5M[3]	~0.5M	Mandatory 14 day self-isolation for close contacts	Free mental health and wellbeing resources provided remotely to people in self-isolation

* Numbers typically do not include pre-existing workers in local public health departments

1. NOK 80 million (USD 7.79M) allocated to three digitalization initiatives, one of which is Smittestopp app; majority going towards contact tracing
2. 1000 contact tracers in Melbourne
3. .The ~24.5M will be dedicated to Public Health Units, but with the

Source: NZ: Center for health security, NZ: Govt., NZ: RNZ; AU: Au Gov, https://helsenorge.no/coronavirus/smittestopp, https://www.forbes.com/sites/davidnikel/2020/03/17/norway-hands-out-2000-fines-or-jail-for-ignoring-coronavirus-quarantine/#7ef917384f42; ; UT: NPR; UT: Deseret, UT: Govt, UT: SL tribe

C Supply chain

Key themes

1. Countries generally faced shortages of national reserves in addition to a lack of pre-established demand management protocols – many countries sought to boost reserve supply or introduce protocols after their first confirmed COVID-19 case
2. Some countries also faced limited domestic manufacturing, exacerbated by the global nature of the pandemic
3. Countries which had the infrastructure in place to mitigate these challenges (e.g., China and its strong domestic manufacturing sector) were better able to secure supply
4. Some nationalized health systems were also able to better allocate supply across geographies through shared supply chains and centralized control of inventory allocation (e.g., Chinese mobilization of supply to Wuhan/Hubei)

Open questions

1. How can governments create the incentives for health system stakeholders to build capacity for emergency production?
2. What is the appropriate level of supply to maintain in national reserves?
3. How can countries develop cross-industry, centralized governance structures to enable rapid decision-making in crises?

C Supply chain

Country comparison

	China	USA	Australia	UK
Data points on size of government or provider reserves	***Limited data*** – limited public transparency into Chinese reserves; supplies were mobilized to Wuhan from Chinese reserves in other provinces	**11.7M N95 masks at start of pandemic;** low relative to total demand	**Providers estimated 120% increase in their ventilator supply** to meet demand	**No gowns, visors, swabs or body bags in national reserves pre-COVID-19;** only 12M of 33M stockpile of FFP3 respirator masks
Government actions to increase supply	**Restricted supply exports, requisitioned factories, increased imports**	**Alternative manufacturing** (Defense Production Act)	**Relaxation of approval** of new supplies**; contracts for domestic production**	**Alternative manufacturing** (e.g., via auto makers)
Government guidance to manage demand via re-use and re-process protocols	**Accelerated approval of reusable mask production**	**CDC released guidelines** for contingency and crisis utilization of N95s	**N/A** – case counts were sufficiently low to not require demand management protocols	**Relaxation of PPE requirements** from mid-March in line with WHO guidelines
Government action to incentivize or allocate supply movement across providers	**Central government mobilization of resources** to Wuhan/Hubei hospitals	**Reserve allocation to providers;** however providers not mandated to share supply	**Reserve allocation to providers;** demand not enough for allocation across providers	**National Supply Distribution Response established to coordinate PPE distribution**

Source: US – https://www.usnews.com/news/politics/articles/2020-04-08/hhs-federal-stocks-of-protective-equipment-nearly-depleted; Australia - https://www.mja.com.au/journal/2020/surge-capacity-australian-intensive-care-units-associated-covid-19-admissions; UK - https://www.bbc.com/news/newsbeat-52440641; China – "Fighting COVID-19: China in Action", press search

D Clinical and workforce data

Key themes

1. Some governments with comprehensive data sets on bed capacity, hospitalizations and inventory were better able to allocate health system capacity across providers
   - Inventory levels enable governments to allocate supply over long distances
   - Workforce and bed data was most useful for tactical decision-making over where to allocate providers and patients over short distances
2. Many data sets were in place before the pandemic and have continued past the peak; however, without real-time data, governments innovated new ways to capture more frequent data, including regular data submissions mandated from providers
3. Some countries without national care delivery systems (e.g., the U.S.) have faced challenges in data collection, with many different electronic health record systems fragmented across organizations

Open questions

1. Which tools established in response to the pandemic will persist in the future?
2. How can governments ensure a competitive private services sector while ensuring its data solutions are end-to-end and interoperable?
3. How will national databases interact with local and provider-level databases in the future?

D Clinical and workforce data

Country comparison

	China	USA	Australia	UK
National data sources used	**National Health Commission database** in addition to provincial databases	**AHA bed database, Medicare cost report, HHS daily COVID-19 database**	**Australia Hospitals Database and Australia COVID-19 data set**	**Several incl. NHS database and UK coronavirus data set**
Type of data collected nationally	**Beds and bed utilization, COVID-19 cases, patient volumes;** no comprehensive inventory collection	**Beds and bed utilization, COVID-19 cases; equipment and supplies stock**	**Beds and bed utilization; COVID-19 cases;** no comprehensive inventory collection	**Beds and bed utilization, COVID-19 cases, patient volumes;** no comprehensive inventory collection
Availability of real-time data	**Medium** – national database is updated monthly typically; however, government has manually collected key COVID-19 data daily from providers	**Medium** – two primary national databases are updated annually; however, new HHS COVID-19 database is updated daily	**Low** – closest available real-time data is daily number of confirmed cases	**Medium** – NHS bed data set is updated quarterly; COVID deaths are reported daily; local health systems generally have strong transparency into week-to-week bed capacity
Examples of how governments have used data	**National mobilization of resources** to Hubei / Wuhan based on demand	**Reserves allocation to providers** based on state databases	**Contact tracing; establishing testing pop-ups; epi models**	**Daily briefing to control news flow; epi modeling to guide policy; tracing apps**

Source: China – expert input; US – expert input; Australia – expert input; UK – NHS database

Data dashboard examples: national provider-level databases (1/2)

Country	Database	Examples of fields included
UK	NHS bed database	Number of beds *(average utilization also included)*
USA	Medicare cost report	Number of beds and average utilization; Workforce (at broad category level); Facility sizes

Org Name	Total	Available: General & Acute	Available: Learning Disabilities	Available: Maternity	Available: Mental Illness
England	128,935	102,186	921	7,689	18,139
BARTS HEALTH NHS TRUST	1,853	1,646	-	207	-
LONDON NORTH WEST UNIVERSITY HEALTHCARE NHS TRUST	1,236	1,168	-	68	-
ROYAL FREE LONDON NHS FOUNDATION TRUST	1,085	995	-	88	2
ROYAL NATIONAL ORTHOPAEDIC HOSPITAL NHS TRUST	153	153	-	-	-
NORTH MIDDLESEX UNIVERSITY HOSPITAL NHS TRUST	544	503	-	41	-
THE HILLINGDON HOSPITALS NHS FOUNDATION TRUST	456	385	-	71	-
NORTH EAST	388	152	12	-	224
KINGSTON H	441	386	-	55	-
BARKING, H	1,014	952	-	62	-
GUY'S AND	1,181	1,083	-	98	-
LEWISHAM /	990	896	-	94	-
CROYDON H	516	455	-	61	-
ST GEORGE'	934	867	-	67	-
KING'S COLLEGE HOSPITAL NHS FOUNDATION TRUST	1,418	1,300	-	118	-
WHITTINGTON HEALTH NHS TRUST	327	262	-	54	11
WEST LONDON NHS TRUST	795	70	-	-	725
GREAT ORMOND STREET HOSPITAL FOR CHILDREN NHS FOUNDATION TRUST	257	250	-	-	7
MOORFIELDS EYE HOSPITAL NHS FOUNDATION TRUST	7	7	-	-	-
OXLEAS NHS FOUNDATION TRUST	398	-	12	-	386
THE ROYAL MARSDEN NHS FOUNDATION TRUST	189	189	-	-	-

XV: # of Staffed Beds	XW: # of Licensed Beds	XX: Bed Utilization Rate	YX: # of Affiliated Physicians	YY: Total Facility Square Footage
248		84.00%	5	350,061
126		59.20%	4	414,816
83	88	33.40%	63	113,869
800		67.40%	961	1,667,118
66	71	51.80%	126	202,419
			21	77,018
		%	604	,034,021
			162	189,411
			360	778,917
		%		6,820
		%		5,583
		%		3,701
		%		193,273

National databases generally contain the type of data needed to support tactical decision-making during crises; however, the frequency with which they are updated is not close enough to real-time

Thus, countries often had to develop ad hoc data sets with manual daily data submissions from providers to support allocation of workforce / resources

Source: UK – NHS database; US – 2018 Medicare cost report

Data dashboard examples: national provider-level databases (2/2)

Country	Database	Examples of fields included
USA	**HHS COVID-19 database (updated daily and manually by hospitals)**	

ID	Information Needed	Definition
1.	State	State where the hospital is located
2.	Hospital name	Name of hospital and CMS Certification Number (CCN), provided in separate fields
3.	Hospital county and Zip Code	County and Zip Code, provided in separate fields, where the hospital is located
4.	All hospital beds	Total number of all staffed inpatient and outpatient beds in your hospital, including all overflow and surge/expansion beds used for inpatients and for outpatients (includes all ICU beds)
5.	Hospital inpatient beds	[illegible] hospital [illegible]ds used
6.	Hospital inpatient bed occupancy	Total number of staffed inpatient beds that are occupied
7.	ICU beds	Total number of staffed inpatient ICU beds
8.	ICU bed occupancy	Total number of staffed inpatient ICU beds that are
9.	Mechanical ventilators	

Number of bed by type with utilization

Equipment

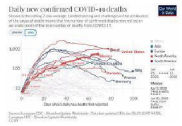
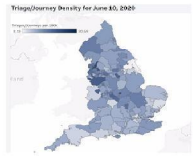
10.	Mechanical ventilators in use	Total number of ventilators in use
11.	Hospitalized COVID patients	Patients currently hospitalized in an inpatient bed who have suspected or confirmed COVID-19
12.	Hospitalized and ventilated COVID patients	Patients currently hospitalized in an inpatient bed who have suspected or confirmed COVID-19 and are on a mechanical ventilator
13.	Hospital onset	Total current inpatients with onset of suspected or confirmed COVID-19 fourteen or more days after admission for a condition other than COVID-19
14.	ED/overflow	Patients with suspected or confirmed COVID-19 who currently are in the Emergency Department (ED) or any overflow location awaiting an inpatient bed
15.	ED/overflow and ventilated	Patients with suspected or confirmed COVID-19 who currently are in the ED or any overflow location awaiting an inpatient bed and on a mechanical ventilator
16.	Previous Day's Deaths	Number of patients with suspected or confirmed COVID-19 who died on the previous calendar day in the hospital,
17.	On-hand supply of N95 masks (if available)	• 4-14 days • 15 or more days
18.	Previous Day's Admissions with Confirmed COVID-19	Enter the number of patients who were admitted to an [illegible] day who had [illegible]sion
19.	Previous Day's Admissions with Suspected COVID-19	[illegible] admitted to an [illegible] day who had suspected COVID-19 at the time of admission

Supplies

Case counts

Source: April 10 letter from U.S. Secretary of Health to hospital administrators

D Data dashboard examples: national public health databases

Country	Database	Examples of fields included	
Global	Our World in Data dashboards	Daily COVID-19 deaths (in addition to data on cases, tests, mortality risk and policy responses)	
USA	CDC dashboards	Daily COVID-19 cases and deaths, ED visit trends, social impacts, school closures and mobility trends at state and county levels	
USA	COVID Exit Strategy	Symptoms and cases, hospital bed capacity and testing capacity by state, with assessments on opening readiness	
UK	NHS Pathways dashboard	Regional counts of COVID-19 assessments through NHS's 111 and 999 call centers	

Global public health databases and dashboards have been developed ad hoc for the purpose of tracking COVID-19 metrics

These dashboards enable public health policymakers to make decisions (e.g., on school closures) though they do not solve the problem of limited provider-level real-time data to enable tactical workforce / supply / facility decision-making

Source: Our World in Data, CDC dashboards, COVID Exit Strategy, NHS Pathways Dashboard

E Vulnerable populations: elderly care

Key themes

1. Governments deployed a range of interventions to mitigate COVID-19 impact on elderly care, the most promising of which were workforce-related (e.g., sick leave and national recruitment of aged-care staff)
2. Providers also introduced additional COVID-19 initiatives to protect residents and staff including cohorting of residents
3. Health authority interventions into elderly care have increased over time (e.g., restricting admissions of COVID-19 patients into residential care)
4. In the short-term, demand for residential care could potentially dampen due to both restricted admissions and consumer confidence; thus, there are greater opportunities for in-home care and telehealth around the world

Open questions

1. How should quality be measured for elderly care facilities?
2. How should governments and facilities prepare for other infections or a second wave of COVID-19?
3. How do we ensure safest workforce practices? (e.g., incentivizing workers to have one place of employment)
4. How do we leverage learnings from COVID-19 to adapt future models of care?
5. What was the impact of these interventions on elderly care outcomes?
6. How do facilities ensure consumer or family experience when these measures particularly affect elderly populations?
7. How do we encourage the uptake of in-home care versus residential care?
8. What does the future of a nursing home look like?

E Elderly care

Country comparison of government interventions into aged care during COVID-19

		Japan	SK[2]	NZ[3]	Australia	Canada	Germany	UK	Singapore	USA
	Cases per million	107	210	233	264	1285	1866	2315	2465	2986
A: Preventing and controlling infection	Infection control guidance to providers	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Increased inspections for residential care		✓	✓		✓				✓
	Mandated visitation restrictions for residential care	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Mandated cancellation of residential care activities						✓			✓
	Ban on staff working at multiple residential care facilities					✓				
	Government infection control training				✓			✓		
	Restrictions on 'non-essential' home care services					✓				
B: Expanding and retaining the aged care workforce	National recruitment for aged care staff (e.g., new recruits, retired workers)					✓	✓	✓		
	Staff wage increases and one-off payments			✓	✓	✓	✓			
	Relaxation of employment requirements (e.g., training, visa requirements)				✓	✓				
	Financial incentives to drive workers into aged care					✓				
C: Testing and case management	Asymptomatic screening of nursing facilities		✓			✓	✓			
	Negative test required before hospital discharge		✓						✓	
	Medical/nursing "SWAT" teams for residential care outbreaks				✓	✓				
D: Ensuring adequate PPE supply	National bulk purchase and distribution of PPE	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Bans on PPE exports		✓					✓		✓
	Subsidies for manufacturing firms to launch PPE production						✓			
	Rapid response PPE (e.g., within 24 hours of request)				✓	✓				
E: Increasing access to support/care	Expansion of local outreach services (e.g., groceries, physical check ins)				✓	✓		✓		✓
	Expansion of telehealth services and online medications	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Payments to seniors (e.g., increase in pension, direct subsidy)			✓	✓	✓			✓	
	Increased flexibility in care assessment process (e.g., by phone, based on file)	✓			✓		✓	✓		
F: Supporting provider viability	Reimbursement of additional costs (e.g., cleaning, PPE, workforce leave payments)		✓	✓	✓	✓	✓	✓		
	Tax exemptions for nursing homes				✓		✓			
	Interest free loans to providers	✓								
	Reduced administrative burden (e.g., reduced reporting requirements)							✓		

Source: Our World In Data; press releases for each country; government guidelines and statements; Intervention analysis based on publicly available information, and as such may not be comprehensive 2. South Korea 3. New Zealand

Several countries have implemented unique aged care interventions

Unique government interventions in aged care during COVID-19

1. Several Canadian states have issued a **ban on staff working at more than one facility,** increasing hours and providing unemployment benefits for part-time staff to implement the initiative
2. Some countries have **introduced mass inspections of residential aged care facilities** to ensure high-quality infection procedures are being undertaken
3. Some countries are implementing more **stringent visitation and access requirements and activity restrictions** (e.g., cancellation of all events and activities in aged care facilities)
4. The UK government has announced plans to **recruit 20,000 people into the social care sector** over the next three months to relieve pressures in the care workforce
5. Multiple countries have planned and initiated **mass asymptomatic COVID-19 testing of residential aged care facilities**
6. South Korea has a particularly **stringent outbreak response** including facility shutdown, no treatment in place, and tests for all staff and residents
7. Some countries **require negative PCR tests before readmission to RACFs**

Countries analysed

E

Vulnerable populations: people experiencing homelessness (PEH)

Key themes

1. Some countries with stronger pre-existing social safety nets, specifically with regard to housing, faced fewer COVID-19 impacts on PEH
2. During the pandemic, key COVID-19 related challenges have included overcrowding, maintaining hygiene standards and staff shortages
3. Publicly announced mitigation approaches have included installation of hygiene stations, distribution of hygiene supplies, and provision of spaces to people experiencing homelessness or housing insecurity to help them isolate

Open questions

1. Which longer-term housing solutions should governments pursue to mitigate impacts of future health crises on PEH?
2. How can governments leverage learnings from COVID-19 to better connect PEH to essential services beyond their COVID-19 needs?

E People experiencing homelessness (PEH) – case comparisons

	1 Key COVID-19-related challenges	2 Publicly announced mitigation approach: Prevention	2 Publicly announced mitigation approach: Testing/ contact tracing	2 Publicly announced mitigation approach: Outbreak response	2 Publicly announced mitigation approach: Isolation approach	3 Publicly announced reopening considerations/ supports
British Columbia	▪ Over 6K homeless across the province ▪ Vancouver homeless population increased >23% over last 5 yrs ▪ Tent encampments have filled several parks ▪ Individuals have higher co-morbidities including chronic conditions, mental health/substance needs	▪ Screened everyone entering a shelter for symptoms ▪ Posted signs with health information around frequented public areas ▪ Installed 41 **hygiene stations** and 11 showering facilities across Vancouver ▪ Increased cleaning and provision of meals to prioritized private **single room occupancy buildings** ▪ Setup a provincial **supplies distribution center**	▪ The most recent provincial testing guidelines prioritize testing for congregate settings, people experiencing homelessness or unstable housing, and providers ▪ Requisitions are labelled to **track rates for these distinct prioritized groups**	▪ Residents were asked to self-isolate for 2 weeks on separate floor of shelter until isolation facilities were set up ▪ Client showing symptoms are **transported to testing/ quarantine centers** ▪ Hygiene supplies and IPC trainings increased for shelters	▪ **8 hotels** (>900 beds) leased for homeless to close park encampments by May 9 ▪ Referral community centers have been designated for **treating symptomatic patients** (>160 beds) ▪ Separate spaces designated for women ▪ **200 winter shelter beds still open to decrease shelter overcrowding**	▪ **Wraparound services offered** including meals, laundry, healthcare, addiction treatment and harm reduction services provided for people experiencing homeless ▪ BC housing looking to **secure longer term measures** (e.g., acquisition of facilities, land or modular options) ▪ B.C. will distribute 3,500 smartphones to people experiencing homelessness to receive COVID-19 info and stay connected while isolating
Washington State	▪ State has ~22K people experiencing homelessness on any given day ▪ 204 homeless COVID-19 cases from 44 different locations ▪ **Challenges include staffing new sites and staff rotating between shelters**	▪ Portable toilets, handwashing stations, and hygiene trailers set up across Seattle; >128 comfort stations in parks kept open for hygiene needs ▪ **Hygiene kits** (included soap and water) delivered to homeless ▪ **Shelter spaces** (e.g., tiny house/trailer village, purchasing a motel, and providing hotel vouchers) expanded ~2,300 to address overcrowding ▪ Seattle has stopped disbanding encampments since March	▪ **Testing and contact tracing ongoing challenge** as people experiencing homeless travel between shelters, vehicles, and unsanctioned camps ▪ Volunteers have set up testing stations near homeless encampments ▪ CDC conducted two rounds of sit visit testing and symptom screening in three shelters finding 18% of residents and 21% of staff tested were positive	▪ Five **largest shelters went into 14-day lockdown** limiting any non-emergency entry or exits to isolate clients and staff after COVID-19 case confirmed ▪ Individuals with confirmed **cases are treated in hospital** not within shelters ▪ Rapid Public Health teams deployed to assess IPC and recommend how to reduce spread in shelters	▪ **Modular sites for isolation and recovery set up** for homeless and housing insecure individuals (e.g., Fisher Pavilion, Exhibition Hall and Community Centers); meals and cleaning services provided for all residents ▪ Hotel leased for confirmed COVID-19 patients' recovery	▪ **Connecting** individuals to **essential services** and making referrals to shelters ▪ State Department of Commerce announced **$250K for Counties' homeless response**

British Columbia: [1], [2], [3], [4], [5], [6], [7], [8]
Washington State: [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11]

VULNERABLE POPULATIONS

As of April 27, 2020

Potential protective actions to consider during reopening for people experiencing homelessness (PEH)

Not Exhaustive

Context

~35% of PEH reside **unsheltered** outdoors (e.g., sidewalks, parks, cars)

~20% of PEH have **serious mental illness** (2017)

Compared to the general population, PEH have **3-6x higher rates of chronic disease** (e.g., heart disease)

PEH are at **increased risk for COVID-19 infection and poor health outcomes**:

- Higher rates of **suboptimal nutrition**, unsanitary conditions and comorbidities
- Limited **access** to traditional channels for **public health guidance**
- Limited **access to clinical facilities** or fear of engaging with medical professionals

Example actions for consideration

Prevention, testing/ contact tracing

Launch a multi-pronged proactive, culturally and medically appropriate COVID-19 screening and testing strategy including **coordinated outreach** to shelters and encampments, **systematic testing** (e.g., block testing) **and tracing**, **data collection** to track numbers screened/tested, positive tests with symptoms or asymptomatic, numbers with additional needs incl. physical comorbidities and behavioral health needs

Expand **sheltering and isolation options**, encampment services and community sanitation measures

- Establish **alternative sheltering strategies** (e.g., lease hotels) to reduce density and create additional isolation options
- Limit camp cleanups to trash removal to **avoid dispersion into community**
- Set up easily accessible **personal hygiene stations** (e.g., toilets, showers, handwashing stations)
- Distribute **basic items** such as socks, soap, hand sanitizer and masks to individuals living outdoors
- Issue guidance and training on **hygiene protocols** in shelter facilities

Equip outreach staff, organizations, and shelters with required sanitation supplies and **PPE**

Streamline **access to testing/treatment/isolation** for confirmed and suspected cases (e.g., mobile clinics, COVID-19 dedicated transport)

Maintain **close communication** with high-risk PEH (e.g., cross-shelter coordination, distribute phones)

Outbreak management includes **rapid response support** from public health teams to ensure timely identification and separation of cases

Isolation/ outbreak response

Expand homeless shelter hours to 24/7 with ability to house homeless families for up to 60 days

Ensure **continued access** to chronic care management and behavioral health services (e.g., community paramedics, street/mobile clinics, virtual kiosks in shelters)

Stand up a **cross-sector COVID-19 coordination team** across various agencies (e.g., health, justice, shelters, housing authorities, faith-based organizations, community services, philanthropies) to

- identify specific challenges related to COVID-19 mitigation
- understand client needs and improve (i.e., exchange food/sanitation/supplies for screening/testing)
- Align resources to offer necessary services (e.g., isolation sites, PPE, hygiene kits)

Example KPIs

Health

- ❑ Infection rate among persons experiencing homelessness
- ❑ # (%) infected safely in isolation / quarantine
- ❑ # (%) of facilities screening residents
- ❑ # (%) facilities adhering to public health guidelines
- ❑ # (%) facilities with on-site access to healthcare providers
- ❑ # (%) homeless in need, with access to mental health services

Social / economic

- ❑ # (%) shelters adhering to physical distancing guidelines
- ❑ # (%) homeless in need of safe shelter
- ❑ # (%) homeless that are women escaping domestic violence
- ❑ # (%) of families with children without a home

Source: Centers for Disease Control and Prevention, US Department of Housing and Urban Development, US Interagency Council on Homelessness, National Low Income Housing Coalition, Statista, White House, National Alliance to End Homelessness, Simmons University , CBC

E

Vulnerable populations: indigenous communities

Key themes

1. Due to existing health and social vulnerabilities, indigenous communities are often at a great risk of COVID-19 morbidity / mortality outcomes
2. As a result, certain interventions for broader populations (e.g., tech-enabled contact tracing or English-language communications) may not adequately meet the needs of indigenous communities
3. Health system stakeholders can protect indigenous communities through collaboration with tribal governments to ensure their interventions for the broader population are culturally relevant and address particular indigenous community vulnerabilities

Open questions

1. Which longer-term housing solutions should governments pursue to mitigate impacts of future health crises on indigenous communities?
2. How can governments leverage learnings from COVID-19 to better connect indigenous communities to essential services beyond their COVID-19 needs?

VULNERABLE POPULATIONS

As of April 27, 2020

E Potential protective actions to consider during reopening for indigenous communities

Not Exhaustive

Context	Example actions for consideration	Example KPIs
Weak infrastructure for basic living needs, e.g., in the U.S.: • 58 out of every 1,000 NA households **lack plumbing** • **Limited access to food supplies, electricity and healthcare services** –e.g., 3x lower rate of health care funding than that reported per person nationwide **Higher rates of poverty, disease and mortality than other non-indigenous communities, e.g., in Canada:** • **47%** of indigenous children live in poverty; 2.5x Canadian rate • **50x higher rate of TB** than Canadian-born non-indigenous people Due to existing vulnerabilities, indigenous communities are often at a great risk of COVID-19 **morbidity / mortality outcomes**	**Prevention, testing/ contact tracing** Collaborate with tribal governments to • design and launch a community-sensitive robust system to monitor health, economic and social conditions for indigenous communities • set up multiple **accessible sites to provide culturally-responsive testing and treatment** with multilingual support • ensure providers and trusted FN/I/M agencies and partners have **access to PPE, hygiene supplies** and other essential items; support distribution to families and other community members **Isolation/ outbreak response** Collaborate with tribal governments to • **support surge capacity planning and expansion of existing capabilities and capacity** within hospitals and provider settings to deliver intensive care if needed (e.g., ICUs, bed capacity, ventilators); streamline facility transfer capabilities and plan for additional field hospitals if needed • ensure adequate healthcare **workforce availability for physical and behavioral health needs**; consider **tele/virtual care** options if workforce shortage; ensure all providers receive appropriate **culturally-responsive training;** hire **translators and/or community representatives** Ensure sufficient **capital and assets** to maintain quality local services by community hospitals and clinics **Additional supports** Collaborate with tribal governments to • Increase availability and speed of broadband or alternative **network connectivity** to support expanded access to healthcare and social services and provincial/federal guidance and support • Ensure and expand access to free **essential resources** for indigenous community members (e.g., clean water, sanitation supplies, food, education) • Develop solutions to **address housing conditions** (e.g., renovations, air purifiers) **and physical distancing constraints** (e.g., redesign community spaces, engage community in renovations) • Offer appropriate supports for **care of the deceased** and **grief counseling** for the community Support community-led delivery of multi-channel, multilingual targeted communications to support prevention and access to care (e.g., public health campaigns, support navigating care resources) Partner with tribal governments, community agencies, celebrities, philanthropies: • Fund, develop, and launch a **community engagement and public health education strategy** • Create **safe isolation sites** (for those infected or for elderly to prevent exposure) • **Fund, procure, and distribute additional supports**	**Health** ❑ # (%) indigenous communities tested for COVID-19 ❑ Indigenous communities COVID-19 infection rate ❑ % supply shortages at tribal facilities for COVID-19 and related conditions ❑ # (%) Indigenous persons with access to telehealth ❑ # (%) Indigenous persons with access to mental health supports **Social / economic** ❑ # (%) in need accessing supports for basic needs (e.g., food, water, safe housing) ❑ # (%) in need accessing economic relief assistance ❑ # (%) access to broadband / internet ❑ # suicide incidents ❑ # overdose incidents

Source: "Native Peoples Amid the COVID-19 Threat" by Christine Samuel-Nakamura and Felicia Schanche Hodge (UCLA); Government of Canada; Centers for Disease Control and Development; National Public Radio; Indian Health Service, New York Times, Mental Health America ; CTV

[1] As of May 13th [2] As of April 27th

E Indigenous communities – case comparisons

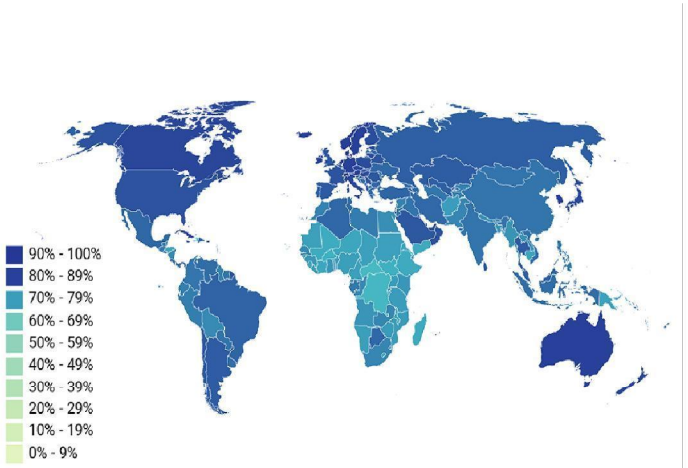
	❶ Key COVID-19-related challenges	❷ Publicly announced mitigation approach: Prevention	❷ Publicly announced mitigation approach: Testing/ contact tracing	❷ Publicly announced mitigation approach: Outbreak response	❷ Publicly announced mitigation approach: Isolation approach	❸ Reopening considerations/ supports
New Mexico	▪ Navajo nation has second highest infection rate, after New York (103 deaths; 3,245 cases for 175K population) ▪ Indian Health Services system stretched ▪ **Housing crisis and multi-generational households challenge physical distancing** ▪ Hand washing is difficult with ~30% of homes lacking running water ▪ **Food shortages and high rates of co-morbidities**	▪ State of emergency declared with curfew/ Shelter-in-place (Mar 13) ▪ Governor **invoked the Riot Control Act to lockdown Gallup** city with army checkpoints refusing entry to non-residents ▪ Musicians, actors, artists involved in education ▪ Incident Command has **home testing teams that also distribute donated supplies** (e.g., bleach, paper towel, food)	▪ Indian Health Services dramatically expanded testing (20,258 or 8% of their population)[1] ▪ Contact tracing hindered by limited cell coverage, 60% don't have internet ▪ Contact tracing shifted from individuals to **"Families under investigation"** to account for household clustering	▪ COVID-19 patients cared for at "Fever clinics" - regional COVID-19 treatment hospitals ▪ Surge capacity plan has progressed six levels, now requiring installation of the temporary treatment sites ▪ Indian Health Services (a branch of Federal Department of Health) has opened **three COVID-19 patient sites** in school gymnasiums and community centers	▪ **Emergency isolation housing** being setup for **isolation of elderly** and individuals with increased health risks ▪ The Federal Emergency Management Agency Army Corps has built three **post-acute care sites for patients to recover at before returning to their family homes**	▪ COVID-19 Emergency Response Fund has **distributed funding designated for indigenous communities**, including 600M for Navajo nation ▪ Emergency expenditure plans being developed including Hazard pay for essential staff and food/essential supply distributions for Navajo people
Australia	▪ No COVID-19 cases in remote communities; 52 or <1% of national cases were urban/small indigenous[2] ▪ One third of indigenous have chronic conditions ▪ **Health staff shortage;** no locations for 14 day isolation required for locum staff ▪ Communities in lockdown struggle to ensure **logistics for sufficient PPE, food, and essential supplies**	▪ Public health and prevention education translated in local languages ▪ Travel restrictions have **closed communities** for 3 months (including government officials/ NGOs); **require approval and negative viral test before entry** ▪ Some communities encouraged elderly to move to outstations	▪ **Rapid tests (<45 mins) sent to 80 remote indigenous territories** for rapid monitoring/response ▪ Contact tracing applied in line with national guidelines ▪ National Indigenous Advisory Group established early in March to **share information and decision-making**	▪ **Nursing teams pre-positioned at regional hospitals** to support COVID-19 management ▪ Remote territories have developed pandemic plans including alternative quarantine options during case investigations ▪ Residents with high **risk of complications will be evacuated** to regional centres for immediate care	▪ Many communities do not have appropriate isolation space so **alternative housing options setup for suspected cases** ▪ Early evacuation protocol in place for confirmed cases and their close contacts; Government increased funding for retrieval services ($50M)	▪ **Food security and supply provision is high priority;** Government working on mid to long term solution ▪ Australian Competition and Consumer Commission **monitoring price gauging** on essential products for remote stores in lockdown communities ▪ **Planning for extended duration restrictions** as public health measures eased

New Mexico: [1], [2], [3], [4], [5], [6], [7], [8], [9]
Australia: [1], [2], [3], [4], [5], [6], [7], [8]

Key themes for providers

Global providers observed declining elective procedures as they focused on treating and preventing COVID-19 ❯ **Along with elective volume decline (and return), providers have also seen rising telehealth use and workforce burnout**

Share of benign surgeries cancelled during COVID-19 peak disruption, %



Source: "Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans," COVIDSurg Collaborative, May 11, 2020.

Elective volumes

- Elective volumes declined globally at similar rates and timings relative to first confirmed COVID-19 cases
  - ~50-80% decline depending on the country and type of elective procedure
  - 2-3 month peak decline following the first confirmed COVID-19 case
- Declines were driven by mandated cancellations to prioritize COVID-19 care, lockdown measures, reduced consumer confidence, and impact of social isolation measures / PPE on throughput / efficiency
- Providers are expected to recover volumes in 12 to 24 months, assuming no second surge

Telehealth

- Telehealth grew rapidly across the world as consumers have had limited access to in-person consultations
- Expansion of public telehealth reimbursement is the main intervention governments have deployed to encourage greater telehealth uptake, regardless of the nature of their health systems
- Countries have kept these measures in place even after the COVID-19 peak has passed, suggesting potential longer term appetite for public telehealth investment

Workforce burnout

- Not all countries experienced significant provider burnout; those which did had higher case counts which resulted in grief/loss, fear for provider/family safety and extended working hours
- Some evidence of effective measures (particularly in the U.S.) include communication strategies, training for clinicians moving into new roles, and resources to meet "360 degree" staff needs
- Financial incentives include assistance funds, pay guarantees for employees with COVID-19, additional PTO, and overtime compensation; increased base compensation for front line teams has been limited (at least in the U.S.)

Select key themes shown; additional detail follows

F Elective volumes

Key themes

1. Elective volumes declined globally at similar rates and timings relative to first confirmed COVID-19 cases
   - ~50-80% decline depending on the country and type of elective procedure
   - 2-3 month peak decline following the first confirmed COVID-19 case
2. Declines were driven by mandated cancellations to prioritize COVID-19 care, lockdown measures, reduced consumer confidence, and impact of social isolation measures / PPE on throughput / efficiency
3. Elective volumes have so far returned faster in some areas of the U.S. and U.K. than in China
4. Consumer confidence has been highest within at-home care and physician office settings (versus, for example, EDs or inpatient settings)
5. Providers could recover volumes in 12 to 24 months, assuming no second surge

Open questions

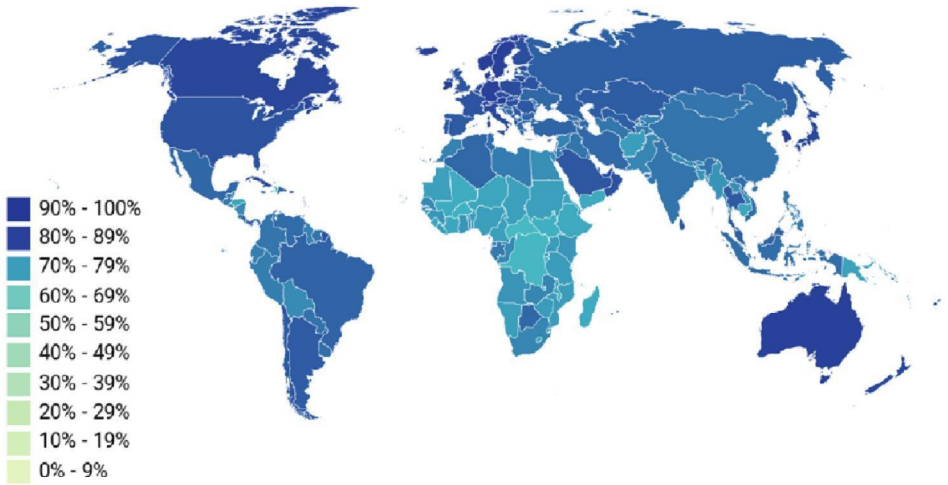
1. What drives consumer confidence?
2. How can providers ensure safety for patients and staff, and therefore create consumer confidence?
3. What is the future of messaging for different types of procedures, ? (e.g., elective emergent versus elective non-emergent)
4. What are the implications of a resurgence on elective volumes?

Data based on 12-week COVID-19 peaks by country; analysis published May 11

F Elective volumes overview

Global elective surgery rates have declined over 70-80% across most developed countries

Share of **benign** surgeries cancelled during COVID-19 peak disruption, %



Source: "Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans," COVIDSurg Collaborative, May 11, 2020.

F Elective volume decline

Country comparison

	China	USA	Australia	UK
Timing of first confirmed COVID-19 case	**Dec. 2019**	**Jan. 2020**	**Jan. 2020**	**Jan. 2020**
Weeks elective volumes dropped after first confirmed case	**~12 weeks** (elective decline in Feb. 2020)	**~8 weeks** (elective decline in Mar. 2020)	**~8 weeks** (elective decline in Mar. 2020)	**~8-12 weeks** (elective decline in Mar. 2020)
Peak elective volume decline, relative to baseline	**~60-80% decline** **70-80% decline for benign surgeries**	**60% decline** **80-90% decline for benign surgeries**	**~50% decline** **90-100% decline for benign surgeries**	**~50% decline** **80-90% decline for benign surgeries**
Stakeholders responsible for cancelling elective volume	**Operationally, elective procedures remained available** with some government closures (e.g., dental); however, lockdowns in effect prevented visits	**Private providers** independently cancelled elective volumes, with government guidance	**Government** mandated cancellation of public and private provider elective volume	**Government** mandated cancellation of all non-urgent elective surgery and block procured all private sector capacity

Sources: China – Transmedia, NHFPC; US – "The Impact of the COVID-19 Pandemic on Outpatient Visits: A Rebound Emerges," Ateev Mehrota et al., May 19, 2020., McKinsey modeling and physician survey; UK - McKinsey modeling and physician survey; Australia – Expert input

F Elective volume return

Country comparison

	China	USA	Australia	UK
Current elective volume decline, relative to baseline	**50% decline** by end of April, eight weeks after peak decline; ~20-30% in mid-late May	**30% decline** by May 10, six weeks after peak decline	***Limited data / TBD***	**~30% decline** by end of May, eight weeks after peak decline
Potential time to recover elective volumes[1]	**12 months**	**9 months**	***Limited data / TBD***	**12 months**
Top service lines being restarted	**N/A** – electives were generally not cancelled	**Adult primary care, BH, surg. onc., cardiac, urology, ENT**	**7 categories identified by gov.** incl. endoscopies	**TBD** – prioritization based on clinical urgency
Early data points on return	**PCI volume improved** from 20% of baseline in Feb. to 50% in April	**OP volumes improved** from 60% below baseline in March to 30% in May	***Limited data / TBD***	**TBD;** NHS has committed to baseline capacity by end of June for non-surgical procedures
Role of government	**High degree of central mandates/guidelines** on operations	**Federal reopening guidelines** which states can implement	**Declared resumption of all electives** with timing up to each state	**High degree of central guidance** into re-start of elective activity
Role of private sector	**N/A** – low role compared to government	**Varies by provider and state guidelines**	**Resume all electives in line with guidelines**	**Partnerships with NHS** to meet demand

1 Defined as time until volume exceeds pre-COVID-19 baseline, starting from first confirmed case; assumes no resurgence of COVID-19; Sources: China – Transmedia, expert input, NHFPC; US – "The Impact of the COVID-19 Pandemic on Outpatient Visits: A Rebound Emerges," Ateev Mehrota et al., May 19, 2020., McKinsey modeling and physician survey; UK - McKinsey modeling and physician survey; Australia – Expert input and government guidance

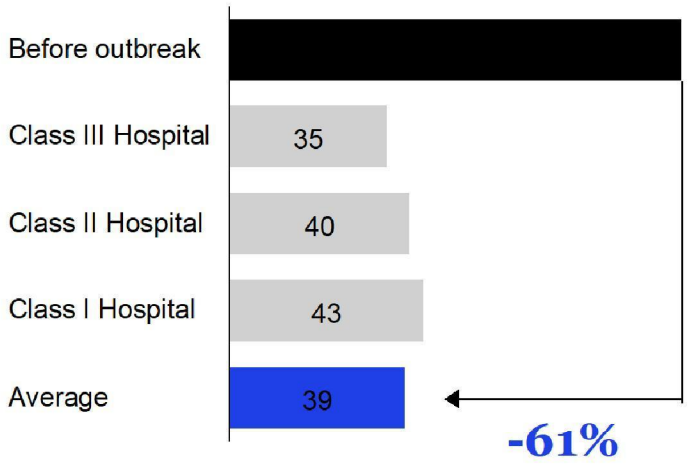
F

China: Outpatient volumes dropped ~60% after outbreak

Preliminary

Number of follow-up outpatients after outbreak[1]

Survey conducted 2020.2.29-3.5, %



94%

Physicians report outpatient flow negatively impacted in outbreak

> *Patient numbers are slowly recovering. We are operating at 30-40% of capacity. As we are the designated hospital for COVID-19 patients, we can only open half of our beds to other patients*
>
> *- Class III Hospital Director*

> *While patient flow decline has been across the board, we see faster recovery in community health centers*
>
> *- GM, MNC pharmaco*

1. A6a. 在发生新冠肺炎(NCP) 疫情后，门诊复诊和续方患者比以前是否有减少？ b.【针对A6a回答"1 是"的医生询问】门诊复诊续方患者比以疫情前减少了多少比例？(n=4529)

Source: CphMRA <Report on the evolution of physicians' demands and behavior under coronavirus pandemic> in March 2020

ELECTIVE VOLUMES

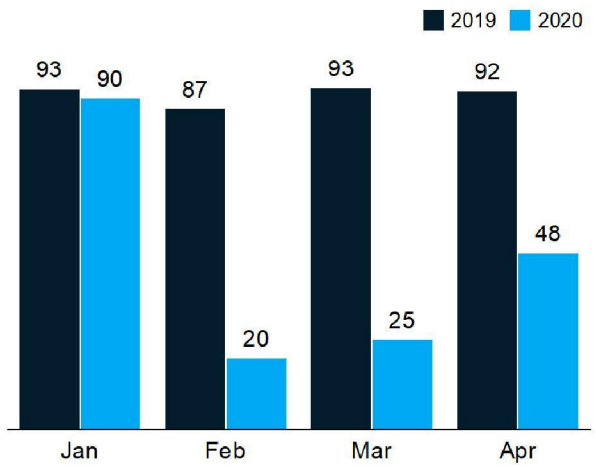
As of mid-May 2020

F

China: Elective volumes have begun to recover, but could take one year to reach baseline

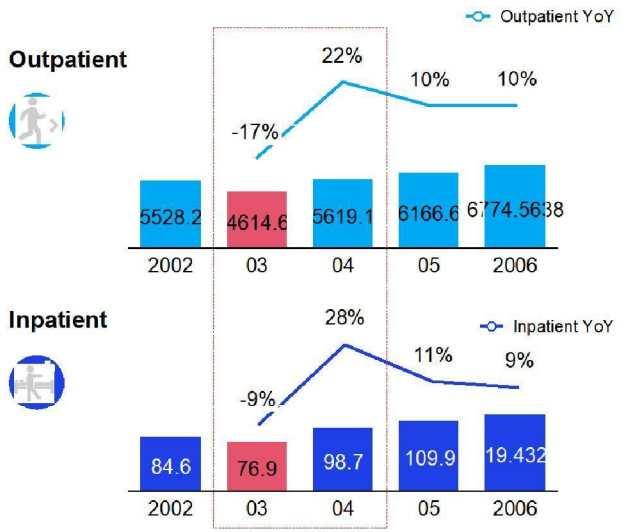
Elective volumes have started to recover since falling in February…

Total PCI volume (proxy for elective care), thousands



…however, past experience in China suggests at least one year to recovery elective volumes

Patient flow in Beijing, tens of thousands



Source: Transmedia

G Telehealth

Key themes

1. Telehealth grew rapidly across the world as consumers have had limited access to in-person consultations
2. Expansion of public telehealth reimbursement is the main intervention governments have deployed to encourage greater telehealth uptake, regardless of the nature of their health systems
3. The U.S. has implemented interventions to enable greater digital access to different providers, e.g., through workforce regulations
4. Countries have kept these measures in place even after the initial increase in infections, suggesting potential longer term appetite for public investment into telehealth

Open questions

1. What is the future of the short-term regulatory changes intended to drive shifts to telehealth? (e.g., public reimbursement, workforce and privacy regulations)
2. How will private payers reimburse telehealth in the long term?
3. How will healthcare professional and patient behavior shift in the future with regard to telehealth?

G Telehealth

Country comparison

	China	USA	Australia	UK
Peak telehealth volume, relative to baseline	**10x newly registered users** for largest telehealth player (PingAn Good Doctor) during peak	**14% of total outpatient visit volume,** peak in mid-April (versus baseline of <1%)	**10 million public telehealth claims in 2020 by mid-May** (versus 50k all year in 2019)	**Increase from 10% of** primary care appointments delivered remotely **to 90% during crisis**
Current telehealth volume, relative to baseline	**Has started to plateau lower than peak levels;** e.g., PingAn Good Doctor MAU declined ~5% from Mar. to Apr.	**12% above baseline as** of May 10 (plateau beginning in mid-April)	**Has started to plateau** beginning at start of May	**Has continued close to peak levels** through end of May
Government interventions to incentivize telehealth	**Expansion of government reimbursement** of provinces for delivering telehealth services; strong central government messaging to providers to use telehealth where possible	**Broader reimbursement authorization, provider licensure reciprocity, relaxation of HIPAA privacy rules**	**Expansion of telehealth reimbursement** through MBS (Medicare Benefits Scheme) until September	**Accelerated approval of platforms and software for digital consultations;** reimbursement already in place or not relevant (e.g., in primary care which is funded on capitation basis)

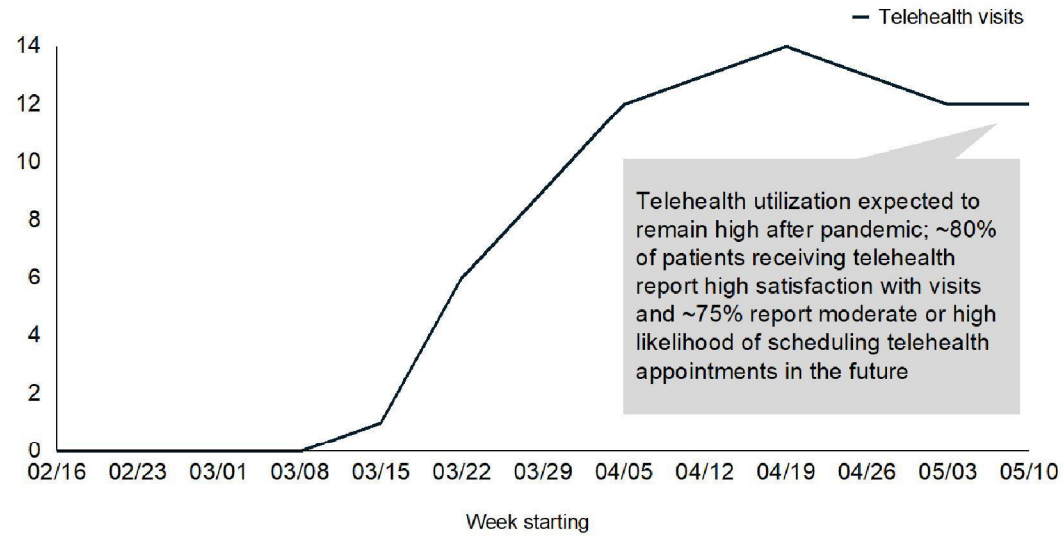
Source: China – iMedia, www.gov.cn:"Fighting COVID-19: China in Action"; US – "The Impact of the COVID-19 Pandemic on Outpatient Visits: A Rebound Emerges," Ateev Mehrota et al., May 19, 2020.; UK – expert input; McKinsey Consumer Insights Survey; McKinsey analysis

ELECTIVE VOLUMES

As of May 19, 2020

US: Telehealth visits rose from less than 1% of all baseline OP visits to ~15% in mid-April

Number of telehealth visits in a given week as a percent of baseline total visits



Government interventions to incentivize telehealth

- Broader reimbursement authorization for telehealth (e.g., reimbursement at parity with in-person visits)
- Provider licensure reciprocity measures (to enable providers to see patients across state lines)
- Relaxed HIPAA rules for virtual platforms usage (i.e., reduced enforcement of traditional patient privacy regulations to enable platforms such as Zoom for telehealth consultations)

Source: US – "The Impact of the COVID-19 Pandemic on Outpatient Visits: A Rebound Emerges," Ateev Mehrota et al., May 19, 2020.; McKinsey analysis; McKinsey Consumer Insights Survey (June 10)

H Workforce burnout

Key themes

1. Not all countries experienced significant provider burnout; those which did had higher case counts which resulted in grief/loss, fear for provider/family safety and extended working hours
2. Governments and providers have taken several steps to address burnout including:
   - Staff safety nets
   - More flexible working models
3. The most promising measures (particularly in the U.S.) have included communication strategies, training for clinicians moving into new roles, and resources to meet "360 degree" staff needs
4. Financial incentives include assistance funds, pay guarantees for employees with COVID-19, additional PTO, and overtime compensation; increased base compensation for front line teams has been limited (at least in the U.S.)

Open questions

1. Which of the short-term measures to address burnout will persist in the future?
2. What other longer-term interventions will emerge to mitigate burnout?
3. In light of burnout and other workforce pressures, how with the healthcare workforce continue to attract top talent?

Workforce burnout

Country comparison

	China	USA	Australia	UK
Data points on provider burnout	**Healthcare workers reported high burnout:** 72% distress, 50% depression, 45% anxiety and 34% insomnia	**~40% of physicians reporting burnout,** driven in part by COVID-19; ~90% of nurses concerned/afraid to come to work	**N/A** – limited impact on provider burnout due to low number of cases	**44% of physicians report burnout, depression or anxiety due to crisis-related long hours and PPE concerns**
Government interventions to mitigate burnout	**Coverage of COVID-19 treatment** under national insurance, **rotations** for high-pressure roles, **and transparent online communication platforms** for colleagues and hospital leadership	**Hotlines for healthcare workers dealing with behavioral health issues** (e.g., in New York State)	**N/A**	**Mental health hotline** introduced by government for NHS staff
Private / nonprofit sector interventions to mitigate burnout	**N/A – providers largely publicly run** and managed centrally by government	**Varying interventions by providers including:** Counselling, crisis hotlines, leave programs, additional PTO	**N/A**	**Nonprofit sector** has significantly contributed to providing **free online access to therapists** for NHS staff

Source: US – McKinsey physician survey (May 5); American Nurses Association (survey from March 20 to April 10); China – JAMA Network Open, "Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019" (March 23)