

The New
Normal



Moving toward precision in managing pandemics: 5 critical domains for success in public health

A thought leadership paper on how to “Expand precision medicine” in public health

Preface

The Insights Series

The Siemens Healthineers **Insights Series** is our preeminent thought leadership platform, drawing on the knowledge and experience of some of the world's most respected healthcare leaders and innovators. The Series explores emerging issues and provides you with practical solutions to today's most pressing healthcare challenges.

We believe that increasing value in healthcare – delivering better outcomes at lower cost – rests on four strategies. These four principles serve as the cornerstones of the **Insights Series**.



The New Normal

The New Normal is a special edition of our **Insights Series** focusing on the COVID-19 pandemic. This series provides recommendations on how to confront the current SARS-CoV-2 outbreak and its implications, as well as strategies and ideas on how to emerge from the current crisis stronger, more resilient, and better prepared to address the healthcare challenges that lie ahead.

Please visit [siemens-healthineers.com/insights-series](https://www.siemens-healthineers.com/insights-series)

Executive summary

How can nations around the world be better prepared for the “new normal” and the next pandemic? While there isn’t one single solution to prepare for new COVID-19 waves and other pandemics, this paper highlights critical elements learned from managing COVID-19 and other outbreaks.

A new pandemic is inevitable, but health systems can be better prepared for the next event. Testing, tracing, surveillance, public health infrastructure, global collaboration, and trusted communication are key to successfully navigating pandemics.

And since not all patients are the same, it is vital to identify high-risk subpopulations to help develop tailored precision medicine approaches among them. The steps described here will help health systems to be better prepared for pandemics. And the experience gained in managing infectious disease outbreaks can help transform care delivery for other medical conditions, spark innovation, and increase the value of care delivered to patients around the globe.

The challenge

The COVID-19 pandemic is an ongoing challenge to public health systems around the world. It has exposed the stark reality that many of these systems could be better prepared to make effective and coordinated responses to combat and contain the spread of a novel infectious disease.

COVID-19 has caused severe and immediate health and economic consequences. Millions have been infected and hundreds of thousands have died. At the same time, massive unemployment and supply chain challenges have pushed social safety nets to the breaking point. And the long-term physical and psychological effects of the pandemic will only become clear over time.

In the midst of this crisis, “infodemics” – rapidly spreading outbreaks of false, misleading, or unsafe information on the pandemic and its fallout – have left many people wondering who they can trust for reliable information on the pandemic. With the advent of online channels and social media platforms, disinformation can spread rapidly and cause serious harm on top of the devastation inflicted by the disease itself.

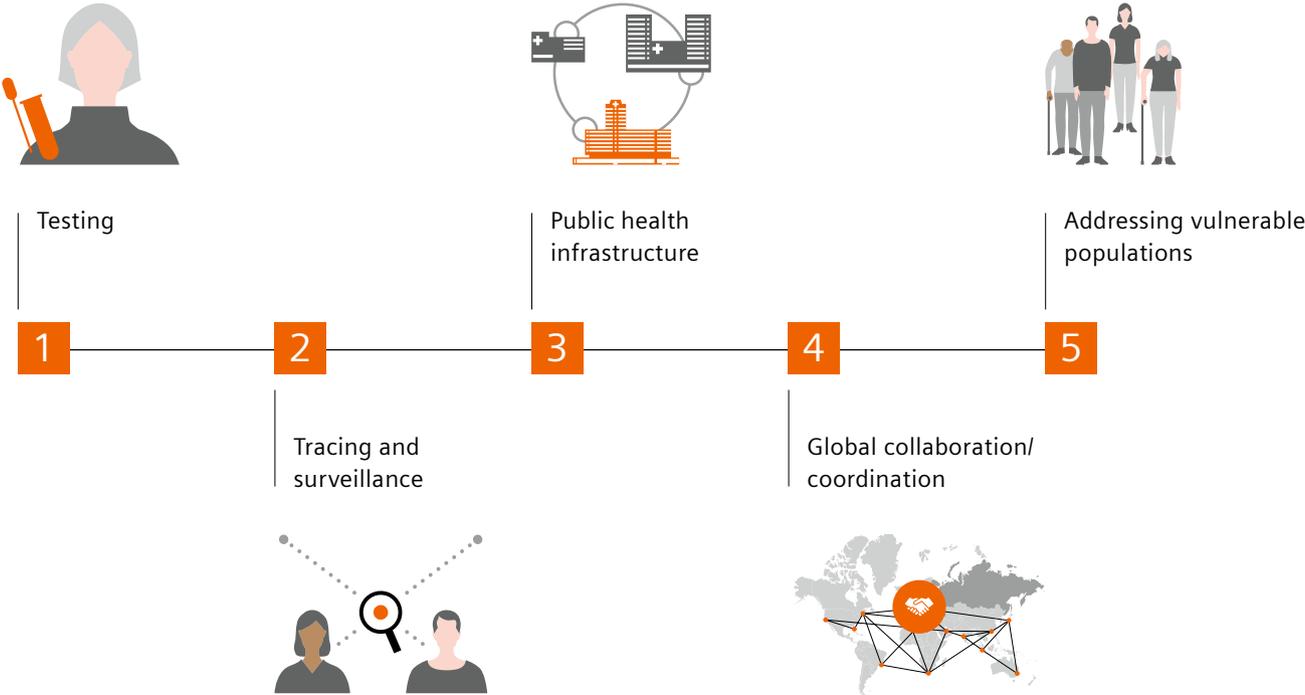
Rapid progress has already been made on a number of fronts. Vaccine development efforts are proceeding at a record pace. Manufacturing concerns have responded by retooling plants and increasing capacity to produce

personal protective equipment (PPE), ventilators, and other vital supplies. Hospital workflows have been radically adapted to the new situation and important diagnostic equipment has been provided at unprecedented speed under difficult circumstances. And control measures such as social distancing have significantly slowed the spread of the virus.

Both the successes and the shortcomings of the response to COVID-19 demonstrate the need for precise, coordinated, data-driven responses to infectious disease outbreaks in order to contain or even prevent the next pandemic.

The solutions

- 1. Testing
- 2. Tracing and surveillance
- 3. Public health infrastructure
- 4. Global collaboration/coordination
- 5. Addressing vulnerable populations



1 Testing

Effective management of the pandemic, both on the individual case level and on the population level, starts with testing. Testing programs should be extensive and massive enough to quickly and accurately identify patients, so that community transmission can be reduced with control measures and care management.

There are two main testing categories for COVID-19: molecular testing detects active disease; antibody (or serological) testing detects patients' prior exposure to SARS-CoV-2, the virus that causes COVID-19.

Molecular testing (by a technique called polymerase chain reaction or PCR) detects viral RNA from a sample taken by a swab inside the nose. People with symptoms or at high risk to contract and spread COVID-19, like healthcare workers, should be considered for PCR testing. A positive PCR test has implications not only for the patient, but also for people who have had exposure to that patient. It is vital that contacts of a patient with COVID-19 self-quarantine as soon as possible, ideally within 24 hours.

PCR testing has important limitations. The test technology and collection techniques are prone to potential errors. Thus, a negative molecular result does not necessarily preclude viral infection. Poor specimen quality, very early infection, improper handling, as well as technical reasons inherent to the test or even potential virus mutation can produce a false negative result. For these reasons, PCR test results must be combined with clinical observations, patient history, and epidemiologic information to guide treatment and quarantine decisions.

Self-quarantine



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David Nash, MD

The other type of testing for COVID-19 is serologic (antibody) testing. Serologic testing is vital to gauge overall population exposure to the virus. This type of test also has significant limitations. For example, an apparently low false positive rate in a population where less than 1% of people have been exposed can mean a substantial absolute number of false positives.

Test quality is vital, and new tests require high accuracy, with close to 100% sensitivity and specificity and proper validation. Clearly, the need for precision and accuracy is an absolute requirement in both molecular and serologic testing.

Test quality

Test quality is vital, and new tests require high accuracy, with close to **100% sensitivity** and **specificity** and **proper validation**.



Serologic testing has also been considered a factor in developing “immunity passports,” government-backed certificates that indicate the bearer has immunity to the virus and can therefore return to work and other activities. However, there is currently no definitive evidence that antibodies produced during COVID-19 recovery confer prolonged immunity and protection from a second infection.¹ “We shouldn’t jump to conclusions and use antibody test results as the sole basis for a return to work and other activities,” said David Nash, MD, Founding Dean Emeritus, Jefferson College of Population Health at Thomas Jefferson University in Philadelphia, PA. “That could potentially lead to continued transmission if it turns out immunity is not conferred by prior exposure,” he continued. We will need more time and studies to confirm the clinical and prognostic significance of the presence of antibodies, beyond the virus infection information they provide.

The key to effective use of both PCR and serologic testing is volume. Testing programs must be massive, coordinated, and well regulated. “Testing, more testing, and even more testing. That is the key to controlling the spread of this virus,” according to Nash.

2 Tracing and surveillance

Contact tracing is a valuable tool to control outbreaks, and even more valuable when the prevalence of infection is relatively low. Effective contact tracing requires a veritable army of tracer personnel and can be enabled by properly used digital tools.

Contact tracing doesn't need to be 100% perfect but needs to be widespread to be highly effective. According to initial estimations referenced by MIT Technology Review, at least 50% of new cases need to be detected – and at least 50% of their contacts isolated – to reduce transmission by 10% or more. And 90% detection and 90% reach of contacts, with 100% testing, can reduce transmission by more than 45%.²



South Korea's COVID-19 success : Data-driven approach supported by public IT infrastructure

SARS, undertook aggressive measures to mitigate the risks of COVID-19. South Korea implemented a number of practices that, considering its high population density, proximity to the epicenter of the COVID-19 outbreak, and relatively open travel policies, appear to have been highly successful to date, as the country has only reported 274 deaths

as of June 8, 2020. These measures allowed Korea to flatten the COVID-19 curve without taking draconian measures. How did South Korea manage its COVID-19 response?

The government focused on data generation, transparency, and sharing to support key decisions. South Korea quickly rolled out innovative data-based methods like drive-thru and walk-thru screening centers, extensive free testing, quick diagnosis, tracking and tracing confirmed cases, the use of information technology to share data, and an effective public and private partnership for the implementation.³

Data Sources	Mobile phone carriers		Institutional records			Movement trackers	
Data Categories	Location data	Personal identification information	Immigration records	Prescription and medical records	CCTV footage	Credit/debit transactions	Transit pass records

South Korea leveraged its IT infrastructure to enable data-driven decision making based on multiple complementary data sources.

“Technology, including smartphone apps, can certainly supplement human contact tracing.”

Achieving the results described above is a daunting challenge and quickly becomes unattainable as infection rates rise. In countries where there’s high prevalence, relatively low testing rates, and a general distrust of guidelines by national agencies, contact tracing is unlikely to be effective on a national level.²

Yet it is important to create the infrastructure for widespread contact tracing now. Contact tracing can help prevent localized outbreaks from becoming regional epidemics. In order for countries like the US to lift social distancing and other precautions and safely reengage in social and economic activity, informed policy guided by data gathered through extensive testing and contact tracing programs is a necessity. According to US CDC Director Robert Redfield, a “... substantial expansion of public health fieldworkers” will be needed to undertake the aggressive contact tracing needed to allow social, recreational, and economic activity to resume safely.

Technology, including smartphone apps, can certainly supplement human contact tracing. However it raises privacy concerns and requires wide uptake and public support to be effective. Such technology-based solutions may be viewed skeptically because of potential privacy risks and the specter of governmental surveillance. Conforming with data privacy regulations in many Western nations, like GDPR in Europe, further complicates technology-based pandemic surveillance efforts. Even in such circumstances, apps and other digital enablers might play an important role in syndromic surveillance, patient education (surveys/chatbots), and population morbidity aggregation.

Complementary, well coordinated digital and non-digital tracing strategies can work in tandem to prevent community transmission. New Zealand accomplished its favorable results by quickly interviewing each patient who tested positive in order to identify recent contacts. This approach was complemented by mobile device apps that help people track recent contacts, in order to rapidly identify and isolate those who may have been exposed to the virus. Similar approaches in other countries, like Uruguay, have produced positive results to date.

In addition to contact tracing, coordinated international surveillance and information sharing will be vital to managing this pandemic and any that may arise in the future.

Contact tracing

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3 Public health infrastructure

In order to respond more effectively to – or even prevent – future outbreaks of COVID-19 or other potential pandemics, many nations would benefit from upgrading their public health infrastructure. Pandemic preparedness has emerged as a key national security and economic imperative. According to one estimate, every month of partial economic shutdown reduces the US gross domestic product by 5%, leading to a loss of \$2 trillion and tens of millions of jobs in just the first couple of months of shutdown in the US.⁴

Contrast this impact with the estimated investments in public health that can reduce the impact of future outbreaks. The costs of contact tracing infrastructure and widespread molecular and serological testing have been estimated at roughly \$5 billion USD, or 0.3% of the initial loss to GDP.⁴

Costs of contact tracing

The costs of contact tracing infrastructure and widespread molecular and serological testing have been estimated at roughly **\$5 billion USD**.



In addition, upgrading and standardizing *healthcare IT infrastructure* will allow real-time data sharing and will help mobilize resources needed to cope with a surge in cases. Real-time data is critical since outbreaks begin as local events. The prime objective in a local outbreak is to stop community transmission. Precision in early detection and mitigation can produce powerful results, as seen in New Zealand and other nations that generated a rapid, comprehensive, and data-driven initial response to COVID-19.

Tracking and increasing reserves of *personal protective equipment*, as well as other critical resources (hospital and ICU beds, ventilators), should align with the creation of plans to rapidly *scale up production and distribution* as needed. A robust, data-driven strategy will enable a precise, timely response that can mitigate some of the clinical and economic impacts of infectious disease outbreaks.

Perhaps one of the most important learnings is that governments should invest in *communication and patient education systems* that provide their people with accurate, up-to-date information and combat the plague of misleading, fragmented, or false information that has left residents of some nations confused as to what they should be doing to protect themselves and others. This will require cooperation and commitment from across the socio-political spectrum in order to create and distribute the most accurate and helpful information available. Centralized guidelines should work in tandem with tailored regional and local efforts to support and inform the public about what to do during a pandemic.

“We're taking that data and giving it extra analytics firepower.”

Beth Blauer

4 Global collaboration/coordination

Viruses and other pathogens do not respect national borders. The ease and prevalence of global trade and travel means that a disease outbreak anywhere in the world can quickly become a pandemic everywhere in the world. This calls for an effective coordination at a global level, on top of national and regional efforts.

A critical element for success is a global infectious disease surveillance system established to provide early warning of, and support for, initial localized outbreaks that could broaden.

Lessons learned in earlier outbreaks led East Asian nations to take aggressive actions to stem the spread of COVID-19, leading to lower caseloads than those seen in many Western nations that were slower to adopt similar actions. This know-how needs to be shared in a collaborative manner, as well as information on the equipment and technology requirements to accomplish rapid testing, tracing, and quarantine. This collaboration can be strengthened by coordination between the public and private sectors for a timely, technology-driven, innovative, and coordinated response to future pandemics.

Having more scientists and analysts working on the problem and sharing information from a variety of contexts and social settings will enhance the effectiveness of local and global responses to future pandemics. “We're taking that data and giving it extra analytics firepower,” said Beth Blauer, Executive Director of the Centers for Civic Impact.⁵

This global collaboration should respect the vast global diversity of cultures and regulations. For example, some measures may be viewed with suspicion where they run contrary to established social mores and political norms. Education and communication programs, along with culturally appropriate community outreach, can help build trust and increase participation in and success of infectious disease mitigation programs.

The full potential of international cooperation can only be reached if sensitive data are protected from both corruption and misuse by bad actors. Blockchain technology and other safeguards can help ensure data security and patient privacy.

Finally, wealthy nations should consider assisting or cooperating with lower-income countries to help manage the spread of infectious diseases. Working closely with countries that don't have the resources of an industrialized nation is a priority in terms of both ethics and national self-interest.

Global collaboration



The **full potential** of international **cooperation** can only be reached if **sensitive data** are **protected** from both corruption and misuse by bad actors.

5 Addressing the most vulnerable patient populations and high-risk groups

People around the world are not homogeneously exposed to the same morbidity/mortality risk, nor to the same risk of infection. Identifying the subpopulations that are most vulnerable provides a more tailored approach for addressing their specific needs.

We know that the elderly and people with chronic comorbidities are at greater risk of morbidity and mortality from COVID-19 than others. But there are other dynamics at play that put additional populations at risk.

Some people face an increased risk of contracting COVID-19 because of higher exposure. This is the case for essential workers, like healthcare workers and workforces in food industries.

Risk of disease

Some **people** face an increased **risk of contracting COVID-19** because of higher exposure.



A clear roadmap to managing infectious disease outbreaks is emerging. Widespread, precise testing is a must. When outbreaks are detected, rapid contact tracing coupled with isolation and other appropriate measures can lower infection rates substantially and prevent widespread infection. Immediate and substantial investments in health infrastructure will help countries cope with the current pandemic and prepare for future events. International cooperation can help identify and contain outbreaks, potentially preventing pandemics.

It is vitally important to identify groups that might face structurally higher risks of both exposure and mortality during outbreaks of infectious disease. Identifying subpopulations – including the elderly, minorities, immigrants, and LGBTQ people in the current pandemic – enables development of tailored prevention and treatment strategies: in other words, precision medicine at scale.

There are many other viruses with the potential to cause a pandemic with an impact equal to or even greater than the current pandemic. We don't know the answer to the question of when the next pandemic will happen. We do know how to mitigate this risk significantly. Now is the time to pursue improved public health infrastructure, national/regional coordination, technology-driven solutions, and pandemic preparedness on a global scale.

Conclusion

A comprehensive response to infectious disease outbreaks requires prompt and accurate identification of subpopulations that are disproportionately affected due to social determinants like income, education, access to care, and geography.

Racial and ethnic disparities play a role, due to economic conditions and unequal healthcare access. In the US, for example, African-Americans face an increased risk of hospitalization and death from COVID-19.⁶ This gap is correlated with a lack of access to healthcare and the high prevalence of asthma and other chronic conditions.

This situation may be even more dire for undocumented immigrants worldwide, who are less likely to seek care for fear of immigration action against them and their families. The LGBTQ community also faces a higher risk due to factors including income, comorbidities and access to healthcare.

Effective, tailored, trusted community outreach will be vital to assessing the impact on, and serving the needs of, vulnerable subpopulations during this and future pandemics. A data-driven precision medicine approach may even predict in advance which subpopulations may be more vulnerable and require additional healthcare infrastructure and support. Containing community transmission within these vulnerable groups is vital to effective pandemic management.



Suggested follow-up on

[siemens-healthineers.com/news/expanding-precision-medicine](https://www.siemens-healthineers.com/news/expanding-precision-medicine)

- Insights Series Issue 8: “Challenges and opportunities in a healthcare environment transformed by COVID-19.” Available at: [siemens-healthineers.com/insights/news/how-can-healthcare-organizations-thrive-covid-19.html](https://www.siemens-healthineers.com/insights/news/how-can-healthcare-organizations-thrive-covid-19.html)
- Insights Series Issue 9: “Managing the impact of caregiver stress and trauma in the COVID-19 era: A strategy toward resilience-building.” Available at: [siemens-healthineers.com/insights/news/managing-the-impact-of-caregiver-stress-and-trauma.html](https://www.siemens-healthineers.com/insights/news/managing-the-impact-of-caregiver-stress-and-trauma.html)
- Siemens Healthineers. “Answering the call to address the COVID-19 pandemic.” Available at: [siemens-healthineers.com/en-us/laboratory-diagnostics/covid-19-response](https://www.siemens-healthineers.com/en-us/laboratory-diagnostics/covid-19-response)



Information:

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Dr. Luis Lasalvia has been keynote guest speaker, panelist, and moderator at about 500 events and conferences around the world; authoring close to 50 peer reviewed papers and articles in prestigious publications; submitting multiple patents in Europe and the US.

His experience potentiates clinical and economic outcomes, inspiring the delivery of concrete high value. He's been leading numerous teams, being advisory board member, developing new ventures, including more than 30 large programs in the US, and other multiple countries in Europe and Latin America.

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With more than ten years' leadership experience in healthcare marketing, Reto Merges has a strong track record in building effective teams for clinical and innovation marketing. In addition, he has four years of work experience in China, ramping up efforts for research collaborations in China and South Korea. Reto Merges holds a degree in electrical engineering and information technology from the Karlsruhe Institute of Technology, Germany, and has studied at the Nanjing Normal University, China. His scientific background is in the field of medical imaging where he has authored many publications and holds multiple patents.

At Siemens Healthineers, our purpose is to enable healthcare providers to increase value by empowering them on their journey towards expanding precision medicine, transforming care delivery, and improving patient experience, all enabled by digitalizing healthcare. An estimated five million patients worldwide everyday benefit from our innovative technologies and services in the areas of diagnostic and therapeutic imaging, laboratory diagnostics and molecular medicine as well as digital health and enterprise services.

We are a leading medical technology company with over 120 years of experience and 18,500 patents globally. With about 50,000 dedicated colleagues in over 70 countries, we will continue to innovate and shape the future of healthcare.

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