Without aggressive disease mitigation strategies like social distancing and shelter-in-place orders, surges in Covid-19 infection can rapidly overwhelm health care capacity and exacerbate death rates. However, with aggressive mitigation strategies in place, radical changes to social and economic activity can have profound consequences on a community’s ability to meet its citizens’ basic needs. This Covid-19 conundrum urgently demands a new next phase: disease suppression. Suppression recognizes that despite the considerable risk of outbreaks reemerging as social distancing is lifted, we must carefully balance these concerns against the grave population health risks of failing to successfully reopen our communities and restart our economies. Kaiser Permanente is developing eight specific capabilities to help achieve effective disease suppression in our health care system. While Covid-19 represents a unique threat, incorporating both time-honored and novel measures as aggressive proactive testing strategies, contact tracing, community health, and home-based care into the existing health care system will help us meet the challenge.

Covid-19 poses an unprecedented threat to community and individual health, unparalleled in recent times. As of May 13, 2020, SARS-CoV-2, the novel coronavirus leading to COVID-19 disease, had resulted in 4.17 million confirmed cases globally and more than 287,000 known deaths. The pandemic has destabilized economies and significantly strained health care systems worldwide. A global crisis of this magnitude – upending life and causing immense human suffering – was last seen during World War II. As such, our response must be commensurate with the challenge: comprehensive, coordinated, and broad.
The Covid-19 Conundrum

Without aggressive disease mitigation strategies like social distancing and shelter-in-place orders, surges in Covid-19 infection can rapidly overwhelm health care capacity and exacerbate death rates.\(^5-10\) However, with aggressive mitigation strategies in place, radical changes to social and economic activity can have profound consequences on a community’s ability to meet its citizens’ basic needs.\(^5,11\)

“The risk of outbreaks reemerging as NPIs are lifted must be balanced with the grave risks of failing to successfully reopen our communities and restart our economies.”

This Covid-19 conundrum urgently demands a new next phase: disease suppression. Suppression efforts aim to keep SARS-CoV-2 infection rates low enough to allow for containment measures in the context of resumed broader health care delivery and economic activity. Covid-19 disease will likely still occur during the suppression phase; however, the goal is to reduce future waves, avoid overwhelming health care systems, and allow for judicious reduction of non-pharmaceutical interventions (NPIs). The risk of outbreaks reemerging as NPIs are lifted must be balanced with the grave risks of failing to successfully reopen our communities and restart our economies. In addition to unemployment and social isolation, deferred preventive and elective surgical care carries its own risks in the effort to maintain a fully functioning health system.\(^4\)

Suppressing this coronavirus will undoubtedly require our highest level of attention to planning, innovation, collaboration, and execution. Repurposing existing programs and tools, such as robust telehealth and contact tracing, may offer a path forward. Kaiser Permanente – one of America’s largest integrated health care delivery systems, serving 12.2 million members in eight states and the District of Columbia – is preparing to face the challenge of protecting our members’ health by controlling Covid-19 spread, leveraging the strengths of our integrated system, and forging partnerships to reopen American communities.

Without the protection of herd immunity or curative treatments, and with vaccines still in early development,\(^12-14\) tremendous uncertainty exists around how to begin safely reopening our communities. Simulation studies predict that ongoing waves of Covid-19 activity could last through 2022.\(^15-17\) Given the profound health consequences that hang in the balance for our communities, inaction is not an option.

The Path Forward

If Covid-19 suppression is to succeed, our collective efforts will require an unprecedented level of coordination among governments, public health agencies, health care systems, industry partners, and community groups. Key industrial and technical capabilities, including rapid testing, contact tracing and isolation procedures, and treatment and vaccine development, must be strengthened.\(^18\) High-quality and timely data must be generated to identify the leading indicators and metrics
for monitoring Covid-19 activity. Clear lines of decision authority are needed to respond rapidly, decisively, and effectively to signs of resurgent infection.

“If Covid-19 suppression is to succeed, our collective efforts will require an unprecedented level of coordination among governments, public health agencies, health care systems, industry partners, and community groups.”

Finally, public-private partnerships that are driven by state or federal agencies are critically important for coordinating activities by diverse contributors. Once Covid-19 activity has fallen to manageable levels, this coordination will enable communities and health care systems to begin a careful and gradual relaxation of NPIs.19

In addition, we at Kaiser Permanente are developing eight specific capabilities to help achieve effective disease suppression. While this pandemic represents a unique event in modern health care, repurposing and expanding existing health care delivery programs, such as robust telehealth and contact tracing, will maximize our ability to meet the challenge.

**Capability #1: Robust testing programs**

Effectively identifying and addressing SARS-CoV-2 reemergence requires an aggressive testing program for symptomatic, exposed, and asymptomatic patients. Widespread, rapid, and strategic testing will form the bedrock of our suppression strategy. As of May 18, Kaiser Permanente had performed more than 233,706 Covid-19 diagnostic PCR tests.20 We are also actively exploring the use of serologic testing for population-based study. While our testing capacity is scaling up, we are using other leading indicators, such as telephone contact through our call center that triggers the cold, cough, and flu symptom scripts, as well as secure email messages between patients and their providers. Upticks in these indicators generally precede patient volume increases in our emergency departments and hospital admissions by 4 to 7 days. We are also considering these indicators: patient symptom surveys, sentinel (early indicator) information from the electronic health record to track trends, publicly available biometric information, and more detailed data within secure messages that would flag disease activity in a given locale.

**Capability #2: Contact tracing, case finding, and isolation**

Contact tracing – the process of identifying Covid-19-positive patients and their contacts through time-intensive “shoe leather epidemiology” – will be a foundational element of successful Covid-19 disease suppression.21 Contact tracing is often used to ensure robust mitigation of infectious diseases, such as tuberculosis and measles, and can be brought to bear on Covid-19 to identify and reduce the risks of community transmission. While new mobile technologies to support contact tracing are rapidly becoming available, organizations like ours must maintain close partnerships with local public health agencies to detect early signs of resurgent infections and trigger responses for case finding, contact tracing, and home isolation.22 Breaking the chain of household
transmission, which may be providing a critical pathway for disease spread, will also be essential.\textsuperscript{23} Guided by our experiences with highly successful population management programs, Kaiser Permanente will work to ensure that infection-prevention practices, early identification of contacts, and testing of additional patients are carried out, whether the setting is a skilled nursing facility, a residential care facility, or a personal home.

**Capability \#3: Community health care**

Covid-19 affects entire communities and cannot be managed effectively by any single health care system. The pandemic has starkly highlighted disparities in income, food security, and technology access within communities.\textsuperscript{24} Vulnerable populations – including people who are immunocompromised, uninsured, and frail and elderly – are more susceptible to poor health care outcomes under the best of circumstances. In addition, some of these populations – including homeless people, incarcerated persons, and residents of assisted living and skilled nursing facilities – are living in situations that make them more vulnerable to disease spread.\textsuperscript{25} Proactive, cross-sector support is critical for addressing these clinical and social determinants of health.

Partnerships between health care systems and advocacy groups can help serve our most vulnerable populations. For example, Kaiser Permanente recently collaborated with the National Health Care for the Homeless Council to increase capacity for preventing and treating cases of Covid-19 within the nation’s homeless population.\textsuperscript{26}

“This crisis has provided an opportunity to accelerate innovation in virtual care, including through home monitoring, telehealth, and acute medical care in the home.”

**Capability \#4: Care of patients in the home, whenever possible**

Patient concerns about becoming infected in hospital or clinic environments have heightened the need for capabilities to deliver care at home, whenever and wherever possible.\textsuperscript{27,28} This crisis has provided an opportunity to accelerate innovation in virtual care, including through home monitoring, telehealth, and acute medical care in the home.\textsuperscript{29} During video and phone visits, providers can remotely check patients with suspected or confirmed Covid-19 and use biometric devices, such as thermometers or pulse oximeters, to monitor symptoms and disease progression. Similarly, Covid-19 therapies typically delivered in hospital settings (e.g., intravenous hydration and nebulizer therapies) can be moved to the home.

At Kaiser Permanente, we seamlessly transitioned most non-Covid-19 patient care to a “virtual first” strategy starting in March. Telehealth visits surged to account for 95\% of adult and family medicine visits at our sites in Northern California. Technology also helped to minimize in-person appointments for suspected Covid-19 cases across our regions. Using teletriage, we encouraged patients to first schedule a telephone or video visit with their physician to determine if they required
testing or an in-person visit. We continued to provide rapid access to in-person care for urgent or emergent cases.

**Capability #5: Maintaining community-level surge capacity**

With the expectation of ongoing Covid-19 outbreaks, health care providers must remain vigilant to preserve excess care capacity for the foreseeable future, including community and regional coordination for acute care. Our system quickly developed detailed operational playbooks for Covid-19 mitigation and hospital surge and shared them online with other health care systems. Our purchasing and inventory program has also innovated to ensure a secure supply chain for medical supplies such as PPE, ventilators, and medications. Going forward, government intervention to solidify a fragile supply chain to providers across the country will be essential.

**Capability #6: Targeted and safe health care reopening**

Aggressive non-pharmaceutical interventions such as social distancing have resulted in substantial decreases in on-site health care, while elective surgeries and other treatments have been temporarily deferred due to state regulations. In the suppression phase, health care organizations like Kaiser Permanente will need to take a careful and graded approach to reinstituting elective surgeries and other care to ensure that we minimize the risks of potential Covid-19 infection as we address ongoing clinical needs. Such decisions will require carefully developed, evidence-based guidelines and targeted risk stratification to prioritize patient care.

The benefits of risk stratification and predictive models to identify which population subgroups will likely benefit from targeted interventions are well described. Kaiser Permanente is deploying innovative risk stratification tools to prioritize deferred surgical and procedural care while also assessing existing tools, such as inpatient early warning scores used to identify adults at risk for deterioration in the hospital, for Covid-19 patient care. Real-time risk modeling will also be helpful in identifying optimal approaches to health care reopening.

**Capability #7: Ongoing research to combat Covid-19**

Covid-19 has presented in highly unusual patterns of clinical disease, with vexing properties that don’t fit neatly with other types of respiratory viral infections. Given its recent emergence, many biologic, physiologic, and clinical questions remain. In addition, more robust epidemiologic data is needed to accurately plan for future Covid-19 surges in the U.S. Kaiser Permanente has rapidly shared our health systems-level data to inform clinical, epidemiologic, and scientific understanding of the impact of Covid-19 in U.S. settings. Predictive and surveillance models will need to accurately identify outbreaks in local communities. Understanding the pathophysiology of this virus, evaluating therapies effective against SARS-CoV-2, and developing and testing vaccine candidates will be important steps for stemming the effects of this pandemic. Kaiser Permanente is actively participating in therapeutic and vaccine clinical trials and building predictive models for suppression-phase surges.
Capability #8: Effective communication

Patients need ongoing education about Covid-19, specifically when they are a part of a contact investigation, and generally about protecting themselves by recognizing symptoms, practicing hand hygiene, covering coughs, and avoiding work and school while ill. This education at Kaiser Permanente takes many forms, including through websites, member handouts, secure mobile messages, call center scripting, and email.

While non-pharmaceutical interventions have proven highly effective at tempering the spread of Covid-19 and preventing further illness and death, they have also radically altered our way of life and potentially introduced new health risks in our communities from deferred preventive and other non-Covid-19 care. We can successfully pivot from mitigation to suppression of Covid-19 disease through a combination of excellence in care delivery, the application of public health principles, more widely available testing, advanced use of technology, improved contact tracing, and the tools of population-based medicine. Society as a whole, and the health care and public health systems in particular, are embarking on an unprecedented task – to demonstrably reduce the effects of a pandemic without an immediately available vaccine. But if successful, we will save lives and preserve our communities for the future.

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Disclosures: This research was supported by The Permanente Medical Group, The Permanente Federation, and Kaiser Foundation Hospitals. Vincent X. Liu was also supported by National Institutes of Health grant R35GM128672.
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