



2022 Global Health Care Outlook

Are we finally seeing the long-promised transformation?

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Overview and outlook

Is the long-awaited seismic shift in health care finally here? A collision of forces—a global pandemic of historic proportions; exponential advances in medical science; an explosion of digital technologies, data access, and analytics; informed and empowered consumers; and a movement from disease care to prevention and well-being—proving to be the catalyst for the clinical, financial, and operational transformation that health care has long promised to the world.

2022 marks the second full year of the COVID-19 pandemic, and it continues to dominate health systems' attention and resources:

- Global COVID-19 cases have climbed above 270.9 million as of December 14, 2021, and the death toll has exceeded 5.31 million.¹ Studies have shown that certain racial and ethnic minority groups and underserved and marginalized populations have been disproportionately impacted by COVID-19, shining a spotlight on the recalcitrant issues around health equity and health outcomes.²
- Low vaccination rates have hampered many countries' ability to contain the pandemic.³ More than half the world's population has yet to receive a single dose of a COVID-19 vaccine, a figure that drops to less than 5% in low-income countries.⁴ Even in developed economies, access issues such as hesitancy, scheduling, transportation and convenient hours are preventing many from receiving the COVID-19 vaccine.⁵
- Recognizing the interconnectedness of our global populations, The World Health Organization (WHO) and other aid groups have appealed to leaders of the world's 20 biggest economies to fund a \$23.4 billion plan to bring COVID-19 vaccines, tests, and drugs to poorer countries in the next 12 months.⁶
- Health care workers are experiencing incredible emotional, physical, and professional stress from responding to COVID-19. In the United States, for example, 55% of frontline health care workers report burnout, with the highest rate (69%) among the youngest staff. Health care organizations are fighting to support their employees and retain talent, especially in clinical populations, leading to renewed need to focus on the workforce experience.
- The pandemic has also decreased access to and consumer demand for non-COVID-19-related medical care. Patients are postponing or forgoing a wide variety of services, including emergency treatment of acute conditions, routine check-ups, and recommended cancer screenings. The long-term health effects from the failure to intervene early, lack of chronic disease management, and undiagnosed conditions will be significant.⁷

Despite COVID-19's many devastating impacts, it does present the health care sector with a powerful opportunity to accelerate innovation and reinvent itself. As we have been envisioning the [Future of Health™](#) and what the ecosystem may look like in 2040, we had anticipated many changes that are occurring today. What we hadn't predicted, was that the global pandemic would be the catalyst to kick start and accelerate those changes so quickly.⁸

COVID-19 has accelerated numerous existing and/or emerging health care trends; among them, shifting consumer preferences and behavior, the integration of life sciences and health care, rapidly evolving digital health technologies, new talent and care delivery models, and clinical innovation.⁹ As sector stakeholders and the consumers they serve face an unfamiliar world of

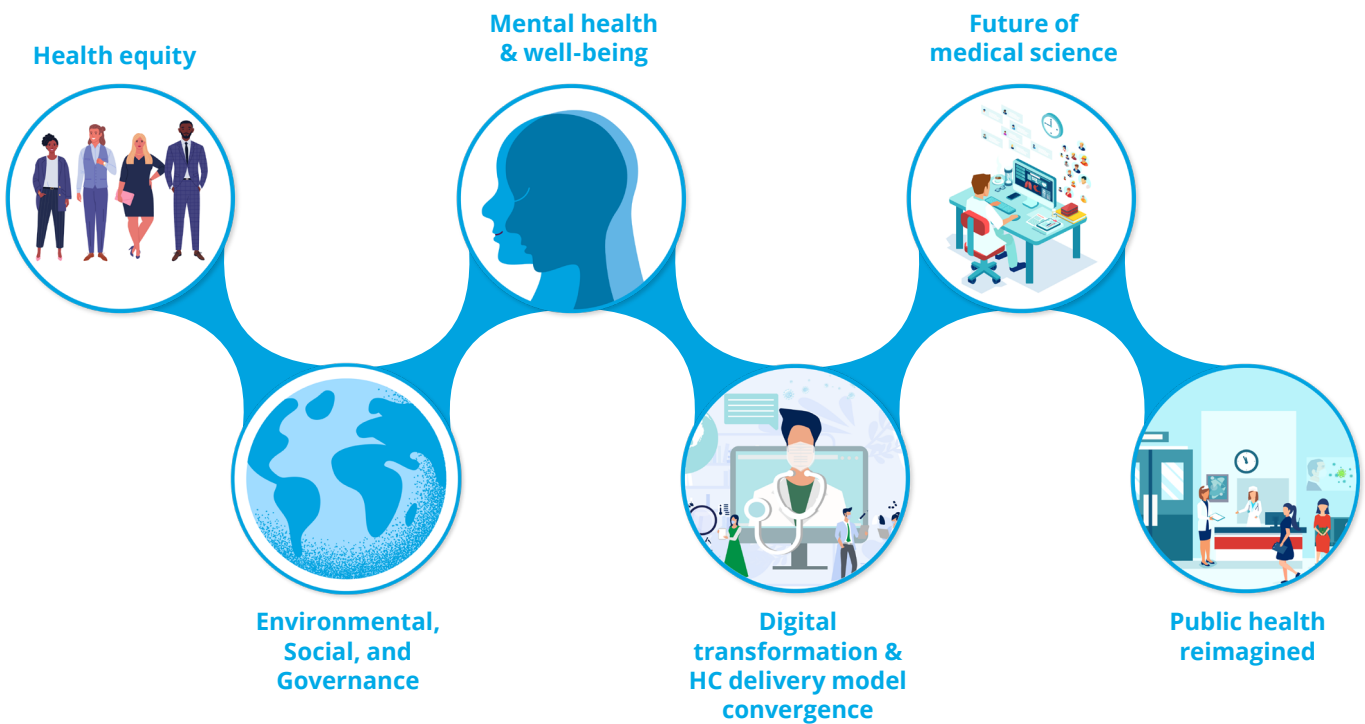
remote working, virtual doctor visits, and a supply chain marked by shortages of medical supplies, personnel, and services, the sector is transforming to meet the new challenges. This sector is also elevating the human experience of the workforce and reshaping what, how, and where work is performed; swiftly scaling virtual health services for COVID-19 and non-COVID-19 patients alike; and forming new partnerships to produce and procure desperately needed vaccines, treatments, and supplies.¹⁰

Despite continuing challenges on multiple fronts, there is a growing optimism that many nations are now better equipped to manage the impact of COVID-19.¹¹ While there is little chance that the coronavirus will disappear altogether, if no new, significant variant emerges, experts see COVID-19 transitioning from pandemic to endemic; meaning that it will be with us indefinitely but at more predictable, manageable levels.¹²

Health care stakeholders in 2022 should remain alert, nimble, and flexible to deal with ongoing spikes and valleys in endemic COVID-19 cases and deaths and other communicable diseases.

We hope that the real legacy of the pandemic is a timely catalyst to initiate and accelerate many of the longstanding challenges and opportunities arising from the six pressing sector issues facing the global health care sector (figure 1). This 2022 outlook reviews the current state of the sector, explores the six issues, and poses questions and suggested actions to transform to the new normal.

Figure 1. Six global health care sector issues





Health equity

Health care organizations are on the front lines of addressing health equity, playing key roles in not only access and care delivery, but also as employers, community members, and advocates for change.¹ What is health equity and why does it matter?

Health equity is more than equitable access to care. It is the ability to fulfill our human potential in all aspects of health and well-being.² It's an opportunity to achieve an overall state of well-being encompassing clinical, mental, social, emotional, physical, and spiritual health, and it is influenced by not just health care, but also social, economic, and environmental factors.³ Health equity has been in the spotlight as study after study has shown that COVID-19 disproportionately impacts historically marginalized and low income groups and that these groups experience barriers that lead to poorer health overall than other parts of the population.⁴ But this type of finding isn't new—it simply highlights structural flaws in the health system, systemic and unintentional bias, and inequities in the drivers of health (DOH; also known as the social determinants of health) have contributed to health inequities in communities across the globe and over centuries in complex and systemic ways. And while the specific way these issues become real in a country or region vary, many are shared. They include:

Structural flaws in the health system

Poverty and lack of effective financing systems for basic services such as primary health care, drug coverage, mental health support, and health screenings are significant barriers to health equity in much of the world, despite efforts to close gaps.

Extreme poverty rose globally in 2020 for the first time in over 20 years,⁵ as the COVID-19 pandemic exacerbated the problems of climate change and geopolitical conflict, which are already impeding poverty reduction efforts. About 100 million additional people are living in poverty as a result of the pandemic, while climate change—a particularly acute threat for countries in Sub-Saharan Africa and South Asia where most of the global poor reside—is expected to drive 68 million to 132 million into poverty by 2030.⁶ More than 40 percent of the global poor live in economies affected by fragility, conflict and violence.⁷

India is among governments including Mexico, Malaysia, China, and others that continue to roll out universal health coverage—even amid the pandemic—in their attempts to improve health equity.⁸ India's out-of-pocket expenditure as a percentage of current health spending is 63%, among the highest in the world. Additionally, a very small population of ~9% is covered under voluntary private insurance, leaving a majority of the population exposed to great financial risks. This situation is gradually changing with the launch of a huge government scheme (The Ayushman Bharat [AB-PMJAY] scheme) in 2018 and State Government extension schemes, which provide comprehensive hospitalization coverage to the bottom 50% of the population (~500 million). However, the COVID-19 pandemic, implementation challenges, and lack of infrastructure has affected the rollout of the program.⁹

Other disparities remain: Brazil's public health system (SUS), for example, offers coverage for the whole population, over 50% of care spend is concentrated in private health care, to which only 23% of the population has access.¹⁰ Other countries simply cannot afford to expand public health services. South Africa's 2021 medium-term budget policy statement proposes further cuts to an already challenging public health system.¹¹

While increasing insurance coverage can help address health care affordability, insufficient and outdated health system infrastructure (facilities, technology, clinicians) remains, for many, a major hurdle to achieving health equity. Fewer than 50% of Africans have access to modern health facilities.¹² Further, around 61% of births were attended by skilled health staff in 2018, far fewer than the 80% global average.¹³ And although more people in India's smaller towns and rural areas now have money for health care through the new PMSBY insurance scheme, they have limited options to use it because clinician and product supply is limited, and government health facilities are few and far between. As of 2019, 9.6% of the 24,855 primary health centers (PHCs) in India had no doctor, 38.4% had no laboratory technician, and 23.9% had no pharmacist.¹⁴ There are also severe gaps in skilled professionals: For rural community health centers in 2019, only 15% of the surgical posts, 13% of the physician posts, 25% of the obstetrics and gynecology posts, and 20% of the pediatrician posts were filled.¹⁵

While there are emerging, scalable, telemedicine solutions in the country, such as apps for self-help, AI-enabled chatbots for diagnosis, and virtual 24x7 counseling, their uptake is hindered by concerns about data privacy and confidentiality. The pandemic-driven economic recession and resulting fiscal deficits are likely to make near-term health care sector capital investment difficult. Many governments will be forced to prioritize spending on filling gaps in clinical workforces even as hospital buildings and equipment deteriorate.¹⁶

Finally, many countries today lack the necessary regulations and policies to counteract and/or eliminate longstanding health inequities. The World Health Organization (WHO) constitution designates "...the highest attainable standard of health as a fundamental right of every human being." This creates a clear set of legal obligations on its 192 member states to enable "access to timely, acceptable, and affordable health care of appropriate quality;"¹⁷ implement policy and programs that "prioritize the needs of those furthest behind first towards greater equity;" and ensure "the right to health must be enjoyed without discrimination on the grounds of race, age, ethnicity or any other status."¹⁸ COVID-19 has made health a priority and many governments are laying the groundwork for post-pandemic health equity improvements.

Systemic and unintentional bias

Ingrained cultural traditions, perceptions, and prejudices (age, race, gender, caste, sexual orientation, disability, mental illness, and more) can interfere with efforts to promote equitable health care. The multigenerational social disease of racism is a prime culprit of health inequity—to the point where racism is a public health crisis.¹⁹ For example, unequal access to quality medical care has led to poor health outcomes for many Black Americans.²⁰ A comprehensive meta-analysis of data from more than 300 articles demonstrates a strong link between racism and poorer mental and physical health outcomes. In addition to the issues of physical safety and security caused by racism, research indicates that racism itself might increase chronic inflammation and the risk of chronic illness.²¹

Gender inequity has proved to be a persistent problem in both high-income and low-income countries, with considerable evidence that shows there is disproportionately less expenditure on the health of girls and women as compared to men. To illustrate, less than 2.5% of publicly funded research in the United Kingdom is dedicated solely to reproductive health, despite the fact that one in three women in the UK will suffer from a reproductive or gynecological health problem.²²

Clinical trials have long lacked meaningful representation of diverse participants that would help provide information about drug response and measures of safety and efficacy in populations that have been historically underrepresented and understudied.²³ Advanced analytics, which include machine learning and artificial intelligence (AI), has the potential to transform the way health care organizations make treatment decisions, detect diseases, and identify rare illnesses. However, this technology also has the potential to exacerbate existing health inequities by embedding unconscious assumptions or biases—gender, racial, or income, and others—of human designers and developers during coding processes.²⁴ Biases that wind up in these tools and models could result in inaccurate clinical decisions, missed diagnoses, worsened clinical outcomes, and substandard patient experiences. For health systems, health plans, health technology firms, and life sciences companies, this can translate to higher costs of care and poorer health among people who already face inequitable outcomes.²⁵ Organizations need to ensure that their analytics solutions make decisions fairly and do not propagate biases when providing recommendations.²⁶

Bridging the trust divide

Consumer and community trust in health care organizations is critical for optimal health, as trust influences willingness to get crucial medical care, preventive screenings, and mental health care.²⁷ Trust is also linked to an improved patient experience, health outcomes, the patient's perception of the care they receive. However, it is also well-documented that in the United States, not all communities feel the same level of trust with their health care organizations. As recently as 2021, there continues to be large disparities in trust by race and ethnicity—a critical focus for health care equity is, therefore, rebuilding trust with racially and ethnically diverse communities.²⁸

Trust remains a top barrier to increasing COVID-19 vaccination rates, especially among certain races/ethnicities. According to the Kaiser Family Foundation, in the US, 38% of unvaccinated adults listed mistrust of the government as a top reason why they did not get vaccinated.²⁹ Deloitte's 2021 consumer vaccine survey shows that identifying trusted sources is essential to get more consumers accurate and safe information on COVID-19 vaccines and treatments, and that these trusted sources vary by race/ethnicity:

- Although doctors were the most trusted source for public health information for all races/ethnicities (70%), Asian (68%), white (66%), and Hispanic (63%) respondents were more likely than Black (54%) respondents to say so.³⁰
- Appointed or elected federal officials were the least trusted sources across racial and ethnic groups. However, they were more trusted amongst consumers who identified as Black (26%), Asian (26%), and Hispanic (28%), compared to only 19% of white consumers.³¹

Where did people go for information about COVID-19? Their personal doctor and friends and family top the list:

- Unvaccinated respondents overall were more likely to go to their friends/family for information (No. 1 source) versus their doctors (No. 2 source). Doctors were the most used source for all other vaccine cohorts.³²
- Black and Hispanic respondents reported nearly equal rates of going to their friends and family as they did to their doctor for information, whereas white and Asian respondents were more likely to go to their doctor.³³

The survey results suggest that personal doctors could be used to get more people vaccinated by offering vaccinations in routine visits or helping people get scheduled. Results also suggest that consumers implicitly trust each other when it comes to vaccine behaviors, highlighting that friends and family could be more influential motivators for change.³⁴

Drivers of health

Some studies estimate that social, economic, and environmental “drivers of health” (also known as social determinants of health) can account for up to 80% of health outcomes, whether positive or negative.³⁵ These drivers of health include factors such as income, location of residence, and the quality of social support networks. Discrimination and bias, including racism, often cause these factors to be negative. This compromises health both by creating an unhealthy environment and lifestyle and by creating challenges of access to health care and health care coverage. Historically marginalized and low-income groups may struggle with disadvantages such as multi-generational poverty, homelessness, unemployment, poor nutrition, violence, and adverse environmental exposure. All of these can limit their ability to obtain quality education, jobs with good pay, healthy food, safe housing, and positive family and community relationships, creating unnatural bottlenecks that can stand in the way of good health.³⁶

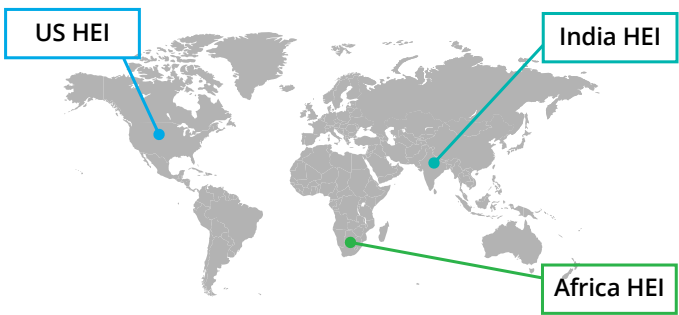
Overcoming systemic, widespread barriers to health equity will require new levels of engagement and collaboration at local, national, and global levels. Leaders from governments, health systems, life sciences/medical device companies, health insurers, academic institutions, community services agencies, and advocacy groups must join forces to design and build systems that advance health equity as an outcome for all.³⁷

The Deloitte Health Equity Institutes

As the pandemic has shined a light on these challenges, Deloitte has established The Deloitte Health Equity Institutes (DHEIs), with initial locations in the United States, India, and Africa (figure 1). The DHEIs are dedicated to advancing health equity as an outcome through an array of cross-sector collaborations, philanthropic investments, and research activity. The three institutes are unified by Deloitte’s commitment to meaningfully contribute to health equity, but designed to deliver against the unique challenges in their respective region.

Figure 1. Deloitte Health Equity Institutes

We have established three **Deloitte Health Equity Institutes (DHEIs)**..



Our DHEIs are looking to address **three root causes** that prevent equitable health outcomes:

- 1** Racial, socioeconomic, gender & other **biases**
- 2** Disparate circumstances in **drivers of health**
- 3** Inadequately designed **healthcare systems**



...to **drive change** through three key reinforcing capabilities



ACTION & IMPACT

Pro bono consulting service to support with health equity initiatives or hard dollar donation to key collaborators



KNOWLEDGE & EVIDENCE

Publicly-available eminence and playbooks to assist both public and private sector efforts to address gaps in health equity



DATE & ANALYTICS

Combining data on health disparities and our data equity to enable insights to inform impactful action

The DHEIs collaborate with local and national organizations across the public, private, and social sectors to advance health equity and achieve better health outcomes. The following are examples of COVID-19 pandemic-related projects that DHEI is conducting in the three service regions:

United States: Increasing COVID-19 vaccination rates in New York City³⁸

Deloitte is collaborating with Robin Hood, an organization that has been fighting poverty in New York City since 1988, to increase COVID-19 vaccination rates among New York's difficult-to-reach populations. The two are funding certain health organizations that are working toward improving access to and acceptance of the vaccine in the hardest-hit communities in New York. These organizations help address issues of misinformation, technology, transportation, as well as fear and distrust rooted in the health care system because of historical mistreatment and bias. As part of their unique collaboration, DHEI and Robin Hood will address the city's other high-need issues, including maternal health and early childhood interventions.

India: Sanjeevani Pariyojana project³⁹

In spring 2021, as COVID-19's delta variant surged in India, Deloitte and northern India's Haryana Karnal district launched a collaborative effort to reduce the strain on hospitals and "extend the hospital ward" by developing a supervised, virtual, in-home care program for people in rural areas with mild or moderate COVID-19 symptoms. Sanjeevani Pariyojana (In Hindi, this translates to The Life Project) mobilized local health care practitioners to help provide early detection (through home test kits), and essential care for home-isolated COVID-19 patients. The program took advantage of Haryana's existing technology infrastructure by adding or enhancing command-center capabilities, and augmenting the availability of telemedicine, virtual triage, and advanced life-support transportation services when patients required higher acuity care.

Africa: Supporting government's COVID-19 response⁴⁰

Deloitte is supporting the South African government, Business for South Africa (B4SA), and other social partners and stakeholders to mobilize business resources and capacity to combat the COVID-19 pandemic. Among specific initiatives, Deloitte created an end-to-end Personal Protective Equipment (PPE) supply chain control-tower dashboard. It consolidates various data sources into a single view from which PPE demand planning and procurement can be monitored and controlled to help reduce gaps for PPE in South Africa.



Q&A with the directors:

Dr. Kulleni Gebreyes, Director, US Deloitte Health Equity Institute

Charu Sehgal, Director, India Deloitte Health Equity Institute

Ashleigh Theophanides, Director, Africa Deloitte Health Equity Institute

What are the challenges for health care leaders who want to have an impact on health equity?

Kulleni Gebreyes: This is a vast and complex issue. When I was working as an emergency room physician, I saw the manifestation of health inequities through individual biases, structural biases, and barriers to care. These quantifiable differences in health-related outcomes have been documented across many dimensions, including race, gender, age, location, disability status, and sexual orientation. These inequities, which include variation in life expectancy, birth outcomes, chronic disease, and morbidity, affect both individual and community health and well-being. One of the biggest challenges for health care leaders is deciding where or how to start. Often, data can help illustrate barriers to health equity and root causes of health care disparities, as in these US examples:

- Black, American Indian, and Alaska Native (AI/AN) women are 2-3x more likely to die from pregnancy-related causes than white women.⁴¹
- 17% of LGBTQ Americans report that they have experienced homelessness in their lifetime, which is more than 2x the rate of homelessness for the general population.⁴²
- About 1 in 8 US women (about 13%) will develop invasive breast cancer over the course of her lifetime.⁴³

Leaders should intentionally design and build systems that advance health equity, and measurement is the only way organizations can know if outcomes are improving. Therefore, leaders must use metric tracking to understand if their programs are having the impact they anticipated. The investment of resources and time also should be aligned with their overall business strategy.

Charu Sehgal: Access to skilled medical care is an issue in India because the clinician supply is limited: 80% of India's doctors cater to 20% of India's population. It takes 10-12 years to become a doctor and a lot of medical practitioners end up choosing high-profile specializations. We need to incentivize more people to become general practitioners in India. In addition, there is an urban/rural divide; there are many open positions for licensed medical professionals in the rural and tribal areas but few physicians want to serve there due to lower pay and lack of professional development opportunities, as well as non-monetary aspects such as living conditions, infrastructure and access to basic medical resources to perform effectively.⁴⁴ There's also a shortage of nurses, ambulance drivers, and Emergency Medical Technicians (EMTs), and the equipment for them to do their job. If you look at every element of the value chain, you will find this problem because health care is underfunded. For example, when it comes to mental health, funding is limited compared to other communicable and non-communicable diseases. India's mental health burden is ~14% of the country's total population, however only 0.05% of the health care budget was allocated to mental health in 2021-2022.^{45,46} It will take increased government investments and incentives to increase supply and improve access to what patients need.

Ashleigh Theophanides: The major challenge on the African continent is access, which we define as both physical access and funding. Rural communities lack health care facilities and have poor infrastructure—roads, power (electricity), communication connectivity—to support the health care ecosystem. Urban areas are more likely to have better infrastructure, but the number of health care facilities remains insufficient to serve the population. A lack of health care professionals (HCPs) also imposes access constraints. Funding is the second major challenge. Governments do not have the funding to invest in major infrastructure projects like hospitals and clinics which would provide access.⁴⁷ Outside of South Africa, the majority of Sub-Saharan countries in Africa rely heavily on Official Development Assistance (ODA) to fund their health care systems. Due to high rates of unemployment and/or low income, the majority of the population is unable to pay for out-of-pocket expenses and, thus, rely exclusively on constrained public health care systems. Also, the majority of ODA funding is directed at specific communicable disease programs like HIV/TB and malaria. This leaves a large gap in the diagnosis and treatment of non-communicable diseases like cancer, diabetes, and heart disease, which we know are increasing on the continent.

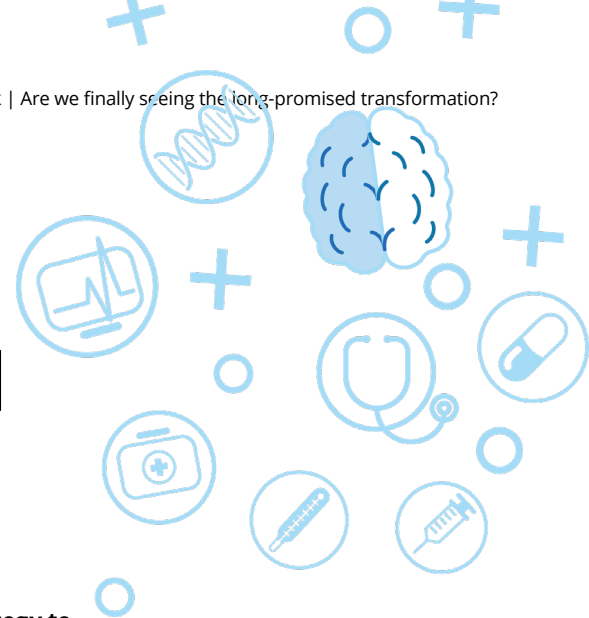
The DHEIs are dedicated to closing the inequity gap in the pursuit of health and well-being for all. Learn how the Institutes are helping to activate health equity around the globe.

[US Deloitte Health Equity Institute](#)

[Africa Deloitte Health Equity Institute](#)

[India Deloitte Health Equity Institute](#)

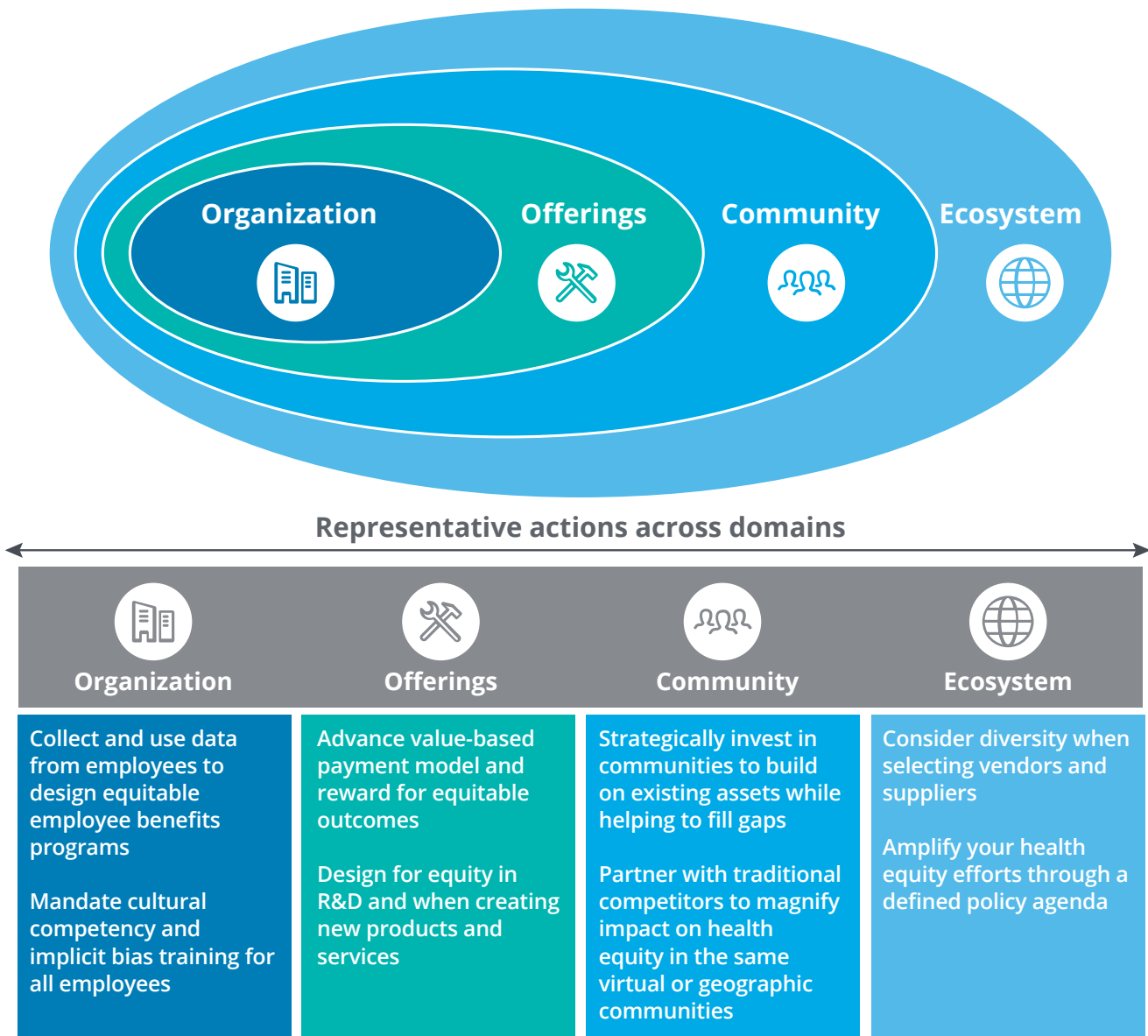
Questions/actions health care leaders should consider for 2022



What steps can health care organizations take to define their health equity strategy to drive change and impact in the communities in which they serve?

A health equity lens is critical for better consumer engagement and a healthy community. Deloitte’s recent research on health care executives’ perspectives on health equity showed that many see the strong connection between diversity and inclusion within their own workforce and improved health equity outcomes among patients.⁴⁸ Health care organizations can work toward systemic change through a strategy that places health equity at the center and expands across four domains: the organization, its offerings, its community, and its ecosystem. Industry players can take specific actions in all these domains to meaningfully advance health equity (figure 2).⁴⁹

Figure 2. Four domains of action to advance health equity



Source: Deloitte analysis and National Academy of Medicine

Deloitte is outlining the steps an organization's leaders can take to define a health equity strategy to drive change and impact in the communities it serves.⁵⁰ Importantly, organizations should bring together both Diversity, Equity, and Inclusion (DE&I) and Drivers of Health (DOH) perspectives when advancing health equity internally.

Phase 1: Understand your organization and market. Assess your organization's current state of health equity and DE&I—including employees' perspectives, feelings, opinions, and experiences—to understand their social, economic, and environmental needs. Identify potential levers (e.g., housing, food insecurity, income) that can lead to more equitable health for your workforce. Also assess your organization's health equity and DEI market positioning. Aggregate internal and public data inputs to profile the insight markets to understand where the health disparities exist today in comparison to the state and national averages. Identify potential foundational changes (people, process, technology) that lead to health equity and develop potential health equity levers of action (e.g., data infrastructure, reporting, interventions, training).

Joint research by the Deloitte Center for Health Solutions and the US National Association of Health Services Executives (NAHSE) on the current state of DE&I initiatives in the health care workforce showed that health care leaders recognize that improving DE&I in the workforce can support quality of care and financial performance goals. Addressing racism and other biases can give organizations a competitive advantage, helping them attract the best talent and elevate their brand and reputation.⁵¹ A diverse and inclusive health care workforce—both in clinical and nonclinical/corporate settings—can also help improve trust and empathy and strengthen the connection with patients and communities.⁵²

Phase 2: Define the health equity vision. Engage leadership and key stakeholders across the organization to gather input to inform and shape the health equity vision. (It is important to share updates on the work with leaders to gain organizational alignment early, which can lead to more effective implementation.) Using the levers identified in Phase 1, align with leadership on the organization's vision—its aspirations and purpose for pursuing health equity—and use it to define specific priorities. Only one-third (31%) of respondents to a recent survey⁵³ said they have a dedicated leader or team committed to establishing and developing processes to systematically address DOH as part of clinical care. Effectively linking DOH initiatives to health equity strategy, as well as the strategy for the larger organization, will likely require assigning accountability and teams with oversight into and responsibility for creating efficiencies across the organization.

Phase 3: Develop a roadmap for the future. Consolidate inputs from Phases 1 and 2 into organization-wide priorities and tactical initiatives—with both short- and long-term outcomes—to advance health equity internally and across the communities that the organization serves. Define the business case for taking action to understand how doing so will lead to positive financial, workforce, and clinical impacts.

Throughout the process, organizations should be guided by the numbers: harness data and technology to understand where to act, monitor success, and scale health equity efforts. For example, Deloitte is developing a health equity index that we hope all corporations and governments will report against on an annual basis as they consider their products' or services' impacts on health equity. The idea is that public disclosure and scrutiny will encourage organizations to act responsibly and address any health inequalities to which they are contributing. Finally, measure results—it's the only way to know if outcomes are improving or worsening⁵⁴ and if health equity programs are making a difference.

Health equity is emerging as one of the most important issues of our time--and not just for health care organizations. Companies around the world are realizing that they have a role to play. In the same way that organizations measure and try to mitigate their carbon footprints, they are starting to consider their "health equity footprint" in a more systematic way.





Environmental, Social, and Governance (ESG)

The public health community has dubbed climate change the 21st century's greatest threat to public health.¹ No country or continent is immune from the health impacts of worsening global climate change. Our warming planet increases the risk for wildfires, rising sea levels, extreme heat, severe weather, and droughts. These factors can have a direct effect on population health and further stress health care infrastructures.² Smoke from wildfires and higher pollen counts can lead to respiratory disease or exacerbate asthma. Extreme heat and droughts can increase the risk of cardiovascular disease and heat stroke.

Climate change has been labeled "as serious a threat to humanity as nuclear war."³ The risks of climate change to the planet's biodiversity also pose risks to the human microbiome, threatening detrimental changes to our immune system and mental well-being.

Pollution, too, is coming under increasing scrutiny for its detrimental health impacts. According to the World Health Organization (WHO), ambient pollution contributes to 4.2 million premature deaths worldwide each year, with the Western Pacific region among the worst affected. The effort to combat pollution has taken on a particularly high profile in China, where officials say that birth defects rose by 70 percent between 1996 and 2010.⁴

Climate change is impacting the conditions in which people are born, grow, work, live, and age, as well as the wider set of forces and systems shaping the conditions of daily life—the drivers of health (DoH), or also known as the social determinants of health. For example, climate change not only has the potential to reduce nutritional value in food, it also can have a negative impact on food production, which can impact food security. In addition, it can lead to economic instability for businesses, resulting in potential job losses. Across the board, social and economic factors are at risk from climate change.⁵

Health costs related to climate change and pollution are estimated at USD \$820 billion a year, according to a recent report.⁶ Leading organizations around the world—including the American Medical Association, the British Medical Association, and the Australian Medical Association—officially recognize climate change as a health emergency.⁷

How is climate change acting as a health care catalyst? We see three horizons: Efforts to decarbonize health care and achieve net-zero; climate change's impact on health systems' infrastructure and workforce; and its impact on people's health and well-being.

1. Getting to net-zero: Decarbonizing health care

It's ironic that the health care sector, which guides medical practitioners' actions with the ethic "first, do no harm" ("primum non nocere"),⁸ is not leaving this world unharmed. Due to health systems' round-the-clock operations, extensive use of air conditioning and refrigerated storage, and specialist medical equipment—and because many hospitals and care facilities are aging and poorly designed for energy efficiency⁹—health care can be seen as a major contributor to the climate crisis.

More than one-third of global heat-related deaths can be attributed to climate change, according to a recent study.¹⁰

The world's health care systems account for 4% of global carbon dioxide emissions, more than aviation or shipping.¹¹ If the health sector was a country, it would be the fifth-largest emitter of greenhouse gas (GHG) emissions on the planet.¹² According to conclusions from the study Health Care's Global Climate Footprint:¹³

- Health care emissions make up a varying percentage of each country's climate footprint. They range from highs in the United States (7.6%), Switzerland (6.7%) and Japan (6.4%), to lows in India (1.5%) and Indonesia (1.9%). While China is the number one absolute greenhouse gas emitter in the world today, this study finds that the United States far surpasses it in terms of absolute health care emissions.
- Emissions emanating directly from health care facilities make up 17% of the sector's worldwide footprint. Indirect emissions from purchased electricity, steam, cooling, and heating comprise another 12%. And the greatest share of emissions—71%—are primarily derived from the health care supply chain; the production, transport, use, and disposal of goods and services that the sector consumes.

A recent study determined that the US health care industry is responsible for roughly 10 percent of the country's greenhouse gas emissions.¹⁴ It is time for health care leaders and their organizations to extend the "do no harm" ethic to the environment—to measure, manage, and set targets to reduce the sector's carbon footprint to fight climate change. The United Kingdom, Australia, and Brazil offer examples of health systems positioning themselves for a "greener" future:

- **United Kingdom:** Freeman Hospital introduced an online ordering system that allows patients' meals to be ordered 12 hours in advance, offering smaller portion sizes, to support correct food preparation and reduce food waste. The hospital also replaced macerators with bio-digesters for plate waste, reducing water use by the equivalent of three Olympic-sized swimming pools annually, and saving the hospital approximately £14,000 on energy, water, and landfill costs.¹⁵
- **Western Australia:** Pingelly & Cunderdin Health Centre's two facilities were designed to reduce their environmental impact. Examples of design features include the use of airlocks (to improve climate control and avoid wind tunnels); natural light, laminated safety glass windows and treatments to reduce heat transfer; grey water systems, water wise gardens and landscaping to reduce water consumption; and installation of solar panels to produce electricity. Both new health centers received a 4 Star Green Star rating.¹⁶
- **Brazil:** The non-profit association Projeto Hospitais Saudáveis (PHS) is dedicated to transforming the country's health sector into an example for society at large in the areas of environmental protection and the health and well-being of workers, patients, and the general population.

Equipping the health care workforce—hospital administrators, clinicians, and support staff—with greater awareness and training to offset climate change’s impact on the health ecosystem is another important undertaking. So are facility-level initiatives to, for example, reduce and dispose of clinical waste and personal protective equipment (PPE) correctly. However, individual health organizations also need to partner with regulators, suppliers, and others to address larger environmental issues. Governments at all levels will play an instrumental role, setting clean energy standards, emissions targets, carbon prices, and other regulatory and policy mechanisms—and also acting as a catalyst through procurement. The technology sector has a critical role to play, as well, in providing the digital infrastructure and solutions to enable a decarbonized health care ecosystem.

2. Climate change’s impact on health systems’ infrastructure and workforce

The increased frequency, intensity, and variability of natural disasters and their downstream effects challenge health care systems’ infrastructure, supply chain, and workforce. Many health care facilities and their support systems are not designed to withstand the impacts of extreme weather events: Infrastructure disruptions (utilities, transportation, communication systems) can impact patient access to emergency and routine services. Supply chain disruptions can lead to shortages (medical equipment, medicine supplies) for patients, providers, and manufacturers.

Already, we are seeing examples where natural disasters have caused challenges for health care systems. In 2012, for example, Hurricane Sandy forced the evacuation of more than 6,400 patients from six hospitals and 21 residential care facilities. NYU Langone Medical Center experienced nearly \$1 billion in damages – operating without an emergency room for 18 months.¹⁷

As climate change’s influence continues to increase, health care leaders will need to build resilience into their facilities, systems, and workforce to withstand natural disasters such as floods, drought, fires, and storms. Doing so is largely about long-term risk reduction: It may not be possible to diminish the risk to zero, but steps can be taken to be prepared in the face of future threats.¹⁸ For example, during the 2010 heat wave in Ahmedabad, India, temperatures reached as high as 46.8°C (116.2°F); a review of one hospital’s records found that its neonatal intensive care unit (NICU) admissions increased dramatically. At the time, the maternity ward was located on the non-air-conditioned hospital’s top floor and under a dark tar roof, making it the hottest area in the building. In response to 2010’s high rate of admissions and neonatal mortality, the maternity ward was moved to the ground floor in 2012, where it was found that, at a cooler 42°C, there was a 64% reduction in heat-related NICU admissions.¹⁹

Workforce skills, capacity, and commitment is a major determinant of health care delivery efficiency and effectiveness.²⁰ This critical resource also constitutes between 70% and 75%²¹ of a hospital or health system’s ongoing operating costs. Understanding the likely impact of climate-related disasters on health care workers is a vital part of any planning/risk mitigation going forward. For examples, organizations should establish contingency working arrangements, such as allowing virtual consults from home or another safe place in the event of extreme weather.

3. Climate change’s impact on people’s health and well-being

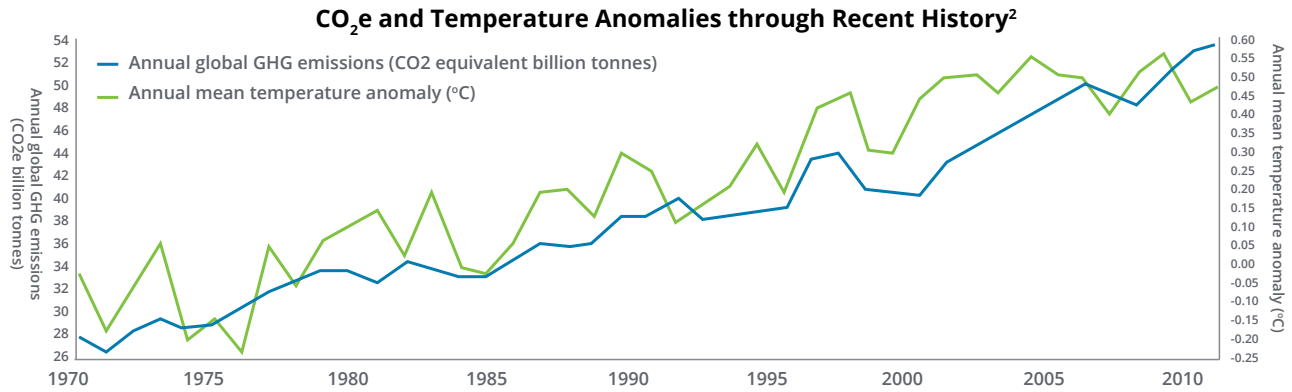
According to the 2020 report of The Lancet Countdown,²² an international collaboration tracking the impact of climate change on health, worsening global climate change is responsible for:

- A 53.7% increase in heat-related deaths in people over 65 years old
- 3.01 million premature deaths from heart and lung disease linked to ambient particulate air pollution
- Undernutrition in some countries due to warmer temperatures, flooding, and drought
- Rising climate suitability for the spread of infectious diseases, which can increase the risk of new pandemics
- Disproportionate impact on vulnerable communities

Climate change is a universal comorbidity (figure 1). Exposure to climate extremes has both direct and indirect effects on physical and mental health. It exacerbates existing conditions, increases vector-borne diseases, and threatens efforts to eradicate/control already eradicated diseases.

Figure 1. Climate change is a universal comorbidity

The science of climate change is as settled as any in the moder canon: human acivity is changing the Earth’s climate in ways that endager the natural environment and all aspects of human civilization. It is a existetial threat to life on earth and the greatest challenge of the 21st century



EXPOSURE PATHWAY

Direct

- Storms
- Drought
- Flooding
- Heatwaves
- Temp.changes
- Wildfires

Indirect

- Water quality
- Air quality
- Land use changes
- Ecological Changes

Mediating factors

Environmental

- Geography
- Baseline weather, air and water quality
- Soil/dust
- Vegetation

Social

- Socioeconomic status
- Baseline health/ nutrition
- Displacemet
- Conflict
- Age and Gender

HEALTH IMPACTS

- Mental Illness
- Undernutrition
- Injuries
- Respiratory Disease
- Allergies
- Cardivasular Disease
- Infectious Disease
- Waterborne Disease
- Heat Stroke

Sources: (1) Peter Ward (2) Data from World Bank, NASA, WEF, IPCC, Deloitte analysis

Absent aggressive and rapid steps to cut emissions, chronic illnesses tied to the environment will likely get worse.²³ To minimize the future risk on human health, efforts should be directed at ensuring the health care system has the capacity and expertise to manage the influx of patients with respiratory, cardiovascular, and other climate change-induced health issues.

Furthermore, climate change threatens the achievement of equitable population-wide health and wellness, as it disproportionately affects disadvantaged populations.²⁴ Children, the elderly, and people with existing health conditions are most threatened by the health impacts of climate disruptions such as flooding, dangerous heat, drought, and poor air quality; threats to these groups are compounded for those belonging to indigenous populations and other historically excluded communities that live with unfavorable, geographically-driven climate factors resulting from historic discrimination.



A longitudinal study modeling the life expectancy for 136 nations found a strong correlation between shortened life spans and low air quality areas, with income inequality identified as an amplifying factor between this negative association.²⁵ And another study, published in the journal *Nature Communications*, “found that in all but six of the largest 175 US cities it examined, people of color had higher exposures to heat than White residents.”²⁶ While climate change threatens health across demographics and communities, the most historically excluded and vulnerable members of society are the most vulnerable to its health effects.

“Climate change is the greatest global health threat facing the world in the 21st century, but it is also the greatest opportunity to redefine the social and environmental determinants of health.”

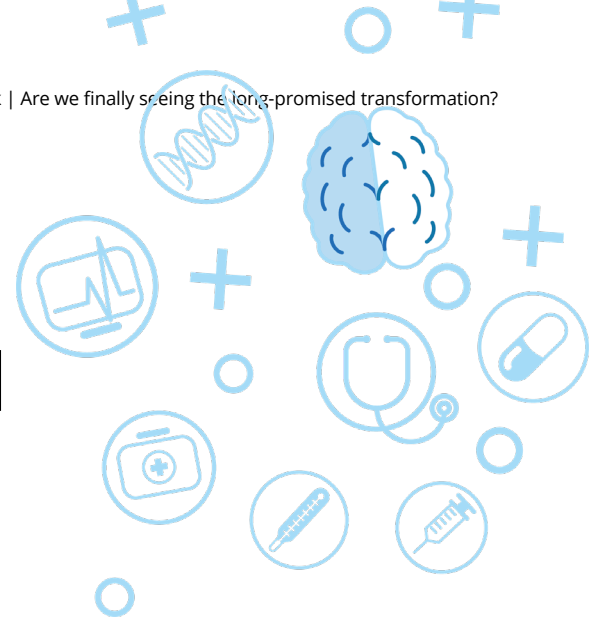
The 2020 report of The Lancet Countdown on health and climate change

To counter the negative effects of climate change, health care organizations need to concurrently employ a mix of mitigation and adaptation/resilience tactics. Some tactics may position the organization to achieve both goals, so identifying opportunities to unlock co-benefits is crucial to developing a portfolio of climate actions. For example, encouraging employees to use active transport (walking, biking) rather than driving reduces an organization's carbon footprint and benefits an individual's health.

Hospitals and health systems are uniquely positioned to advance practices and solutions to protect the health of people and the planet. Through their status as huge employers, major producers and purchasers of goods and services, they can lead and influence supply chains. In addition, they can collaborate with and support the efforts of other sector stakeholders to act on climate change. Consider these examples:

- **National Health Service (NHS):** The UK's publicly-funded health system has been working to reduce its carbon footprint for more than a decade. Between 2009 and 2019, the NHS says it reduced carbon-dioxide emissions by 26%. A decarbonized UK electricity grid significantly reduced energy-related emissions, and the phase-out of chlorofluorocarbon propellants in inhalers also helped to decrease greenhouse gas emissions. More recently, increased use of telehealth monitoring, remote diagnostics, and virtual appointments is helping cut air pollution related to car emissions. The next step, according to NHS, is to convert gas boilers to electric heat pumps and switch to a low-carbon energy source.²⁷
- **Kaiser Permanente:** Last fall, California-based Kaiser Permanente announced that it had become carbon-neutral. Onsite, Kaiser Permanente installed solar panels, made long-term purchases of renewable energy, and took other steps to make its buildings more energy efficient. The organization is also sourcing local and sustainable healthy food for its patients and employees. It also has taken steps to substantially reduce food waste in its supply chain. Off-site, the health system invested in ways to offset emissions generated by its hospitals.²⁸
- **Health Care Without Harm²⁹** is a non-profit organization that works to transform the health care sector worldwide so that it reduces its environmental footprint, becomes a community anchor for sustainability and a leader in the global movement for environmental health and justice. In July 2021, the organization launched Climate Impact Checkup, a unique tool developed for any health care facility in the world to measure, manage and track GHG emissions to support climate change mitigation goals.

Questions/actions health care leaders should consider for 2022



The sheer magnitude and complexity of environmental, social, and governance challenges can be overwhelming. Where should health care organizations start, and what might the journey look like?

Mitigating and adapting to climate change presents a global opportunity to remake the foundations of health care and introduce new operational models for resilience and sustainability. An organization's response to climate change should not be an "add-on" initiative; it should be integrated into a transparent, comprehensive planning and decision-making process. To begin the journey, sector leaders should set aside existing frameworks and preconceptions about what the health care sector—and their organization's place in it—should look like and assess, instead, their role in a sector that is likely to be reconfigured as it moves toward a low-carbon footing.

Among actions to consider:

Develop a business case to show the economic benefits of reducing health care's waste and carbon footprint.

Health care leaders typically focus on access, quality, and cost when identifying and assessing enterprise-level improvement opportunities. It's time to add a fourth dimension to deliberations: environmental sustainability. While this doesn't mean an organization will always choose the (sometimes pricier) sustainable option, there are ways to address the needs of multiple priority areas to achieve clinical, financial, and environmental objectives. For example:

- The health care ecosystem encourages **healthy behaviors**, such as reducing meat consumption and biking over driving, which have a **positive downstream climate impact**.
- Micro-interventions build over time to **prevent disease** from developing in the first place, which **reduces demand** for carbon-intensive health care infrastructure.
- Health recommendations that are **personalized and extend beyond** traditional care delivery improve health systems' ability to **target "hot spots"** and effect greater change.
- Right-sized care is **less service- and carbon-intense** due to improved baseline health across a population.

Understand where value is likely to be created in a low-carbon future. Value drivers in a low-carbon health care economy include using less; emitting less; regenerating, restoring, and repairing; and measuring, verifying, disclosing, valuing, and tracking. Specific action items could include implementing energy efficiency and renewable energy to get to net-zero energy usage; reducing water consumption and reuse; investigating sustainability ratings for hospitals and other facilities; designing energy efficiency into new buildings; procuring sustainable and ethical materials and equipment; and employing models of care delivery that avoid unnecessary or duplicative testing and treatment. Creative thinking can uncover virtually limitless opportunities for value-creation in a low-carbon future.

Adopt systems thinking to address climate change. Every public and commercial health care entity has both an individual and a collective role to play in accelerating the transition to a low-carbon economy. Start with the basics of understanding your carbon footprint and identifying the major levers you can pull to introduce change. Adopting a systems-thinking approach can help leaders look beyond their organization's carbon-reducing initiatives and answer questions that can unlock critical, interconnected opportunities:³⁰ How can health systems invest in their communities to improve planetary and human health at the same time? What about leveraging purchasing power and general operations budgets to create demand for products that have an environmental and health benefit? How might emerging technologies such as virtual health and increased computing power from cloud, artificial intelligence and machine learning be combined with new business models to create more resilience in health care systems?³¹



Mental health & well-being

Recent health, climate, and political crises have both highlighted and exacerbated the world's mental health challenges. In particular, the COVID-19 pandemic has shone a light on fissures and failings within the global mental health system and the institutions surrounding and supporting it. In fact, it has illuminated the fact that mental health is more than a health issue alone, clearly highlighting the sociology of mental health in ways previously given lip service, but never really having been responded to in a concerted, systemized way.

Public health agencies have warned that a wave of depression and anxiety,¹ post-traumatic stress disorder, and other mental ill-health issues are on the horizon due to multiple crises in 2020,^{2,3} inciting urgent calls to action. In addition to COVID-19's impacts, multiple studies have found a strong link between heavy social media use and an increased risk for depression, anxiety, loneliness, self-harm, and even suicidal thoughts.⁴ Mental and behavioral health is also moving up the priority list in government, provider, health plan, and employer health equity discussions.

Mental health and behavioral health difficulties place a significant and under-recognized burden on the global economy, public and private health care systems, people's social needs, and basic human rights.⁵ The human cost is immense:



Between a quarter and half of the global population is affected by a mental health challenge at some point in their lives.⁶



Nearly 800,000 people die by suicide each year, which is roughly one death every 40 seconds. Suicide is the second leading cause of death in the world for people aged 15-24 years.⁷



Between 2011 and 2030, the cumulative economic output loss associated with mental health difficulties is projected to be \$16.3 trillion worldwide.⁸



Secondary consequences of mental ill-health are estimated to cost employers USD \$2,000 per employee per year from absenteeism, presenteeism (employees habitually coming to work when they shouldn't—especially coming in sick or working overly long hours), leaveism (improper use of leave), and unnecessary turnover.⁹ Deloitte research comparing the cost of poor mental health to UK employers in 2017 and in 2020 shows an increase from £33 billion–£42 billion to up to £45 billion annually, due mainly to a significant increase in presenteeism and leaveism.¹⁰



Direct and indirect costs of mental ill health are estimated at over 4% of global GDP, more than the cost of cancer, diabetes, and chronic respiratory disease combined. By 2030, mental illness costs are expected to reach more than USD \$6 trillion annually.¹¹

2022's co-occurring pandemic is the pandemic of mental health. The continuation of COVID-19-induced lockdowns, deaths of loved ones, and financial stressors has shone a light on the ubiquitous lack of access to timely, high-quality, and affordable mental health services worldwide.

The COVID-19 pandemic's detrimental impacts have elevated the topic of mental health in many countries' political and social agendas. Similarly, prominent individuals' willingness to discuss their mental health issues in public forums is democratizing the topic, especially among younger generations. However, significant roadblocks exist to normalizing mental health care on a broad scale (figure 1):

Figure 1: Major challenges faced in achieving better global mental health outcomes.



Stigma, discrimination, and absence of legal and medical protections



Chronic underspend, inaction, and lack of access



Sub-scale and siloed health care systems



Gaps in clinical and scientific knowledge



Changing determinants of mental health

In large swaths of the world, mental illness is stigmatized and regarded as shameful. While there has been some perception shifts during the course of the pandemic, and governments in traditionally conservative countries like Singapore, India, and China (the latter two countries account for one third of the global burden of mental illness¹²) are starting to roll out mental health programs, many societies lack widespread understanding that mental illness is like any other illness. It requires health literacy to recognize symptoms at every age, prevention strategies established in primary school-aged children, early diagnosis, and timely access to effective treatments.

Another challenge to enabling effective mental health programs is a persistent workforce shortage. Despite increasing use of peer support workers, there just aren't enough psychiatrists, psychologists, nurses, social workers, occupational therapists, and other mental health workers to deal with the number of people who need help: The median numbers of mental health workers per 100,000 population vary. The global median of mental health workers is nine per 100,000 people (varying from below two per 100,000 in low-income countries to over 70 in high-income countries). That's less than one mental health worker per 10,000 people.¹³ Replacing the traditional hour-long psychotherapy session with brief solution and goal-focused models of therapy may ease workforce shortages without treatment outcomes suffering. In addition, adoption of digital approaches to mental health care could become an essential tool. These efficacious, convenient, and affordable apps can be used in conjunction with traditional, face-to-face therapy, or as the platform to provide synchronous or asynchronous support from a mental health therapist. A growing body of evidence shows that these types of platforms have increased accessibility by removing social stigma and the challenge of traveling to an in-person appointment. They are also facilitating access for those who have previously shied away from face-to-face therapy.¹⁴

Funding models are a longstanding barrier. For decades, mental health care has been tremendously under-resourced compared to physical health care. Mental health spending made up just 0.4% of global aid spending on health between 2000 and 2014. Low-income countries today spend an average of just 0.5% of their health budgets on mental health, with most of the money going to hospitals that function more like asylums than treatment centers. Even though funding levels are inching up, mental health has not yet risen to a priority area on the global health agenda.¹⁵

Necessity and opportunity are aligning for countries to produce transformative versions of mental health care that will be less expensive than traditional medicalized care. Doing so calls for:

- Emphasizing living/lived experience and shifting from prescriptive treatment to consumer empowerment and participatory decision-making
- Recognizing that mental health is part of a broader overall health experience in that it impacts and is impacted by physical, social, and relational well-being
- Identifying entrenched disparities and inequities in diagnosing and treating mental illness
- Designing models of care that augment face-to-face therapies with digital support
- Migrating from institutional to community mental health program delivery
- Focusing on early intervention and prevention
- Encouraging multi-stakeholder collaboration—governments, health care providers and insurers, community organizations, academic institutions, public companies, media outlets, and consumers—to advocate for mental health awareness and fund initiatives
- Training health systems and care providers to implement models of care that promote access and outcomes
- Utilizing the power of relationships and human connection through the inclusion of family, friends, and community supports in mental health prevention and treatment efforts

Australia tackles mental health system issues



Australia is at the forefront of countries responding to mental health system deficiencies and opportunities. In one major development, the [Royal Commission into Victoria's Mental Health System issued its final report](#) in February 2021; the undertaking represents the most comprehensive analysis ever of Victoria's mental health system to repair what Premier Daniel Andrews conceded was a "broken" system.¹⁷ The Royal Commission's final report articulates an ambitious new vision for the state's mental health service design, commissioning, delivery and governance. It identifies key opportunities and challenges and highlights responses from key bodies across the sector. The interim report in December 2019 included nine recommendations requiring urgent action and the final includes 65 recommendations in areas including: Aboriginal social and emotional well-being; collaborative center for mental health and well-being; community-based mental health and well-being; families, caregivers, and supporters; infant, child and youth mental health and well-being services, suicide prevention and response; workforce; and promoting mental well-being for all Victorians. Finally, the report looks to the immediate next steps that will support the implementation phase of the reform project. It is hoped that once the reforms have been implemented, the Victorian system will become the national benchmark, and that other states and territories may follow Victoria's lead.¹⁸

Emerging focus areas: Digital technologies, role of employers, impact measurement

Digital technologies have great potential to transform global mental and behavioral health systems to be more accessible, affordable, scalable, and fit-for-purpose. Case in point: the increased use of virtual mental health services by females under age 45 during the COVID-19 pandemic. Studies have shown that the pandemic has affected women—mothers in particular;¹⁸—more profoundly than men,¹⁹ and that lack of adequate domestic and emotional support can have detrimental mental health consequences.²⁰ For women who are pregnant or new moms during the pandemic, isolation can be especially difficult.²¹ However, this demographic appears to be taking advantage of virtual mental health services' flexibility and convenience: There is clearly a spike in usage and utilization during evening hours and much of that footprint is occupied by working mothers.

Applying digital technologies in mental and behavioral health care continues to trend positive—at a macro level there's been a huge R&D push for solution development. Technology giants, existing mental health providers, and disruptive innovators are working independently and collaboratively with health care providers, insurers, governments, public health agencies, and academic institutions to advance digital solutions that address various mental health conditions. But there are two concerning bottlenecks: identifying evidence-based, clinically efficacious, and effective solutions among the myriad being developed, and ensuring that consumers make the best selection to meet their specific needs.

The COVID-19 pandemic has helped to accelerate the development and adoption of digital health apps;²² Apple's²³ and Google's online app stores now offer over 10,000 apps related to mental health.²⁴ Online services such as internet-based Cognitive Behavioral Therapy (iCBT) courses are becoming more common. Even computer games, wearables, and augmented reality are being showcased for their utility in mental and behavioral health intervention. Most are being marketed directly to consumers, who have been adopting them at dramatic rates during COVID.

Regulated, evidence-based, mental health apps can help improve access to advice and support as well as help to reduce symptoms of anxiety and depression. However, the overwhelming majority of available mental health apps and online programs are not evidence-based,²⁶ and many are unlikely to be effective. Also, there currently is no quality control mechanism nor regulatory oversight of digital mental health solutions, raising ethical concerns about these new tools and services²⁷ and illustrating the need for trusted agents or governing bodies to forge a path to establish safety and quality digital mental health standards.

The **World Economic Forum** and **Deloitte** have developed a **global governance toolkit** that aims to provide governments, regulators and independent assurance bodies with the tools to protect personal data, ensure high quality of service and address safety concerns. This toolkit is a practical next step to help stakeholders:

- Understand the potential for digital mental health services in improving the mental and behavioral health of all people
- Develop principles and standards for the safe, ethical, and strategic implementation of digital mental health services
- Adapt, pilot, and adopt these standards and principles in countries, jurisdictions, health systems, and across the globe
- Improve access, efficacy, quality, and safety of digital mental health solutions by adopting better practices and standards
- Make strategic investment and incentivization decisions in the global digital mental health ecosystem to encourage its growth
- Make informed decisions to seamlessly incorporate digital mental health tools into a health system, workplace, community, product, or service



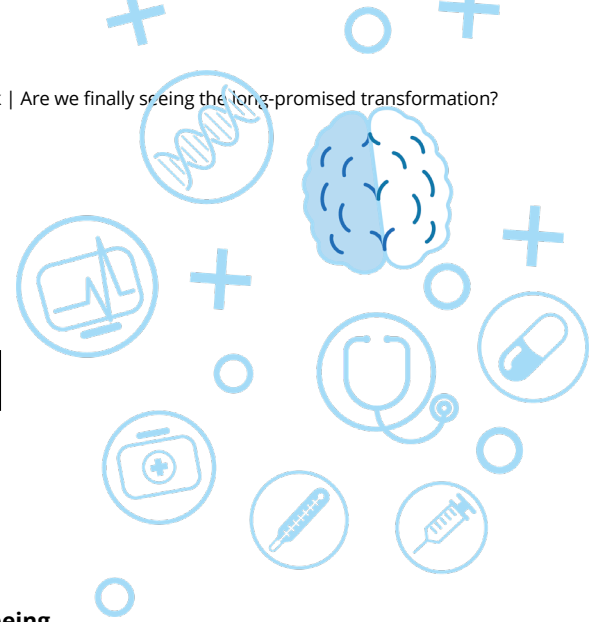
Fortunately, there are some very responsible and evidence-based digital mental health solutions available to consumers; many at little or no cost. As one example of this, Black Dog Institute, an independent, not-for-profit medical research institute affiliated with UNSW Sydney in Australia, emphasizes efficacious treatments and evidence-based programs. Black Dog provides free, online mental health support tools and mobile apps that are developed and tested through ‘translational’ research trials.²⁸ Among its offerings are an online clinic/personal assessment tool that users can discuss with their primary care physician; myCompass, a self-help program for people with mild to moderate depression, anxiety, and stress; and HeadGear, an easy-to-use smartphone app that guides users through a 30-day mental fitness challenge designed to build resilience and well-being.²⁹

In addition to interest in leveraging digital solutions in mental and behavioral health care, discussions are growing around the merits of increased employer involvement and investment in supporting both mental health and well-being in the workplace, versus leaving it to government, insurers, or the employees themselves. Employers have a vested interest in doing so: Poor mental health impacts individuals’ overall health, their ability to work productively (if at all), their relationships with others, and societal costs related to unemployment, and health and social care.³⁰ The challenge we see in organizations is that they often conflate mental health with wellness (“they are the same”), or unintentionally promote the message that mental illness can be treated via a wellness intervention. When organizations perpetuate that myth, it can have negative consequences on the workforce.

While more employers are reviewing activities and developing strategies around employee mental health and well-being, many face challenges bringing proposed programs to fruition. These include a failure to see employee mental health as a priority versus other operational demands; a reactive approach to implementing mental health and well-being policies rather than focusing on prevention; a lack of understanding around how the company currently performs in this space; a poor evidence base to measure programs’ return on investment (ROI); and a dearth of best practice examples to promote improvements. Workplace stigma and perceptions around mental health underlie and exacerbate many of these challenges.³¹

Many organizations are focused on interventions (e.g., apps to track moods) but it also is going to be critically important for leaders to reflect on how they can create a workplace that is conducive to achieving good mental health and well-being for their employees. This means assessing the underlying causes of workplace stress (such as poor workplace culture, job design, low levels of autonomy, complicated reporting lines, bullying, sexual harassment, etc.) and leaders authentically responding to them. There are also opportunities to think about how organizational data can be leveraged to better support earlier identification of potential/emerging problems to enable real time responses (i.e., time sheet tracking of long hours, extended periods of absenteeism). Having better access to data that can help signify where things may be going awry will be integral to informing the most appropriate workplace response, especially when linked to strategies that seek to target the underlying causes prior to them occurring.

Questions/actions health care leaders should consider for 2022



How can we activate efforts to improve mental and behavioral health and well-being in our organization and the larger community?

Greater public awareness, increasing political attention, and growing emphasis on employer involvement—attributable, in part, to the COVID-19 pandemic and the spike in expressed need for mental health solutions—are providing unprecedented opportunities to amplify and act on important access and equity issues and to develop systems and services that are fit for purpose. Just as we personalize treatments for physical disease in individuals through an understanding of their microbiome and the personal stressors in their life, we can work to develop personalized mental well-being plans that are enabled and supported through a robust mental health wellness ecosystem. Among actions to consider:

Create mental health ecosystems. Mental health is a complex issue that requires collaboration among diverse stakeholders in the public and private sectors. Creating mental health-focused ecosystems comprised of governments, health care agencies/providers and insurers, corporations, technology disruptors, community organizations, academic institutions, and patient advocates can open the door to coordinated actions, investments, and advocacy to support local, national, regional, and global mental health initiatives.

Encourage employers to take an active role in employee mental health and well-being. Employers have a key role to play in supporting employees' mental health and well-being. There are two immediate opportunity areas for large employers—specifically, large health plans—to step up: piloting mental health and wellness solutions with their own employees, and sharing data with organizations that are testing whether or not their employee population would be favorably impacted by a particular solution. Importantly, employers need to guard against programs that disproportionately focus on white-collar and knowledge workers at the expense of other employees.

Provide governance to increase trust in digital mental health solutions. Disruptive technologies provide an opportunity to overcome challenges and create breakthrough solutions that improve mental health and well-being outcomes on a greater scale than ever before. They also raise ethical questions about safety, efficacy, equity, and sustainability—many of which are not answered by current regulatory structures and leave stakeholders open to possible privacy, quality, and safety risks. Resources such as the global governance toolkit developed by the World Economic Forum and Deloitte can help stakeholders develop, adapt, pilot, and adopt principles and standards to seamlessly incorporate digital mental health tools into a health system, workplace, community, product, or service.

Integrate mental health assessment and intervention into existing health care systems. By integrating mental health offerings into existing physical health-focused organizations, such as primary care and inpatient hospital settings, attention to mental health can become more ingrained in the health care culture. Prevention and treatment protocols and plans can include whole person health in lieu of solely focusing on physical health challenges, which never exist in isolation. There are no physical health problems without psychosocial components, and no psychosocial problems without physical health challenges. Integration can improve quality of care and satisfaction for consumers and providers, help to reduce mental health stigma, and reduce rates of avoidable health care spending.



Digital transformation and health care delivery model convergence

Health care delivery has been under intensifying pressure and scrutiny during the COVID-19 pandemic, as health systems around the globe struggle with skyrocketing patient numbers, employee burnout and workforce shortages, supply chain disruptions and equipment scarcities, and insufficient and/or outdated facilities. Travel bans are making it difficult to recruit foreign staff, so governments have been enlisting retired doctors and nurses and medical students to assist with patient care. Infrastructure concerns include the availability of intensive care beds, ventilators, and personal protective equipment (PPE). Paradoxically, the pandemic's economic recession and health systems' increasing costs provide the perfect storm to force health care systems to change their workforce, infrastructure models and care delivery models to continue to meet quality and access targets but achieve this from a reduced cost base.

One solution lies in digital transformation and health care delivery model (HCDM) convergence—a trend that has accelerated during the pandemic. Social distancing measures have already forced many providers to employ virtual care technology for scheduled outpatient appointments. Hospitals and health systems are turning to cloud computing, 5G telecommunications, artificial intelligence (AI), and interoperable data and analytics to address current challenges and build digitally powered care delivery models for the Future of Health™.

Deloitte health care leaders recently shared their perspectives on the challenges and opportunities arising from digital transformation and HCDM convergence.

Discussion participants

Tina Wheeler, US Health Care Sector Leader

Dr. Rohan Hammett, Asia Pacific Life Sciences & Health Care Industry Leader

Neal Batra, Future of Health™ Leader

Stephanie Allen, Global Health Care Sector Leader

Marc Perlman, Global Health Care Digital Transformation Leader

Eric Foote, US Health Care Cloud Leader

Dr. Bruce Green, US Federal Chief Medical Officer

Tracey Aegerter, Principal

What factors are accelerating convergence of digital technologies and health care delivery models?

Tina Wheeler: The rise of consumerism is driving health care digital technology use. Providers, health plans and other stakeholders are turning to digital to meet consumers' evolving needs and expectations, improve patient engagement and experience, and drive loyalty. Digital transformation is an essential step in preparing for a consumer-centric Future of Health™.

Dr. Rohan Hammett: The Future of Health™ describes what care will look like going forward. Digital transformation and delivery model convergence is how we deliver that future. These intertwined elements provide the infrastructure that brings everything together; that makes everything work. And while convergence is moving forward, there are still a lot of questions to address: What funding and business models do we need to make this work? How do we use new digital capabilities to reimagine care delivery to make it more value- and outcome-focused? How do we introduce change management across the enterprise and incentivize our workforce to adopt digital technologies? What metrics do we use to determine the success of our transformation efforts?

Marc Perlman: Accelerating digital/care model convergence comes down to demand, access, and cost efficiency. If you're a patient in a small town or rural area you may not have access to the specialists or facilities you need. And, in many parts of the world, health care funding is limited and, as a result, health systems need to maximize limited resources. The best care is integrated care, with the right resource being applied at the right time by a care giver who is practicing at top of license with technology as an enabler to that care. Digital transformation creates an interoperable superhighway to providing care everywhere.

Neal Batra: It's about meeting patients where they are; using digital technologies to construct, staff, and equip a "hospital without walls" that blends inpatient care with alternative models including community- and home-based care. In the future, patients and their families are going to assume responsibility for more of their care; they are going to need advanced digital tools that empower them to do that. What will be necessary and possible in the future is radically different than what is available today.

Dr. Bruce Green: The health ecosystem is on the right track to digital transformation and delivery model convergence, but organization leaders and technology innovators will have to reassure regulators, physicians, nurses, and patients that new digital health products and services are safe and effective. Can we get there? Yes. Will stakeholders' ability to collect, analyze, and share data widely and securely accelerate convergence? Yes. Will we need tools and education to improve health literacy and patient ownership? Yes. Convergence will happen but it will take time.



Which technologies are or should be leading digital transformation-health care convergence?

Tina Wheeler: If we truly intend to move to consumer-centric care, it's time for providers and the wider health ecosystem to position virtual health care as an integral delivery channel—one that can increase access and convenience and reduce total cost of care—rather than a temporary, substitutive channel in response to COVID-19 restrictions. This will require operating and financial mindset shifts such as: expanding credentialization of the clinical and non-clinical workforce to empower virtual care teams to conduct high-touch work in a virtual setting; investing in platforms and solutions that can be leveraged across parties—insurers, providers, retailers—to drive patients to appropriate sites of care, enable care delivery, and produce continuity of care; engaging with patients to not only encourage them to seek virtual options when possible, but to also engage more actively in the management of their health by using trackers, monitors, and other tools; and optimizing revenue for virtual health through consistent reimbursement models and risk-sharing arrangements with health plans.

Dr. Bruce Green: COVID-19 illuminated care model deficiencies that technologies could help solve. In addition to shortening the pathways to care, virtual health can stabilize the supply of physicians and increase the overall capacity of the health care system by multiplying the reach of each physician through digital pathways. Most hospitals have integrated telehealth to provide convenient access to their specialists. Some hospital groups are expanding their telehealth services to create new revenue streams. Executives and technologists are also preparing for how high-speed connectivity, including 5G telecommunications, will transform virtual health usage, with wide-scale deployments expected in the next three-to-five years.

Stephanie Allen: 5G is mobilizing and weaponizing nontraditional points of care. Advanced wireless technologies will continuously monitor our well-being, delivering real-time insights and personalized behavioral nudges on the go. Say, for example, you're driving to work and your ambient AI assistant notifies you that you took the last of your remaining blood pressure and statin pills this morning. The AI assistant also says that there's a pharmacy in three exits and it took the liberty of calling your scripts in there. You exit the highway, stop at the pharmacy drive-through, and pick up your pills. A convenient, five-minute detour prevents an interruption of your medication. It's that level of ambient intelligence that will enable us to proactively manage our well-being in the future.

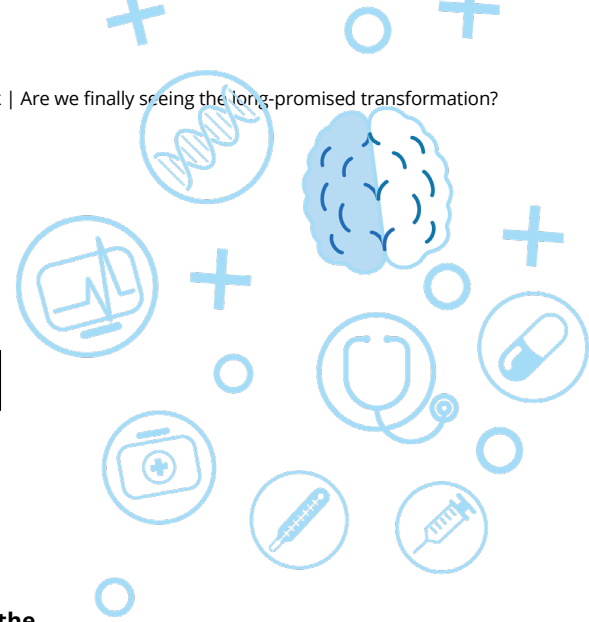
Eric Foote: Health care cloud investment and adoption is on an upward trajectory. In this post-COVID, stability-focused environment, health system executives are looking, first and foremost, for cost efficiency—every clinical and business function is being asked to optimize wherever possible. Organizations are turning to cloud and its companions Platform as a Service (PaaS), Infrastructure as a Service (IaaS), and Software as a Service (SaaS) to improve operations, smooth capital spend, and eliminate brick-and-mortar data centers. Many initially select cloud for disaster recovery because it is the least risky and most valuable capability from a cost-saving perspective. However, we also are seeing escalating interest by health systems outside of the United States in migrating mission-critical electronic health record (EHR) systems to the cloud, which can be completed inexpensively and quickly (often in minutes) using automation.

Tracey Aegerter: I would be hard-pressed to name a health care organization that's not using some cloud-related services. In addition to gains in cost efficiency, the data and insight an organization accrues from cloud computing can improve the patient flow process. The other piece that is extremely relevant right now—especially given the tremendous amount of Personally Identifiable Information (PII) and Protected Health Information (PHI) that health systems hold—is that cloud can help strengthen data security and cyber controls across an organization and its clinical and business partners, especially in areas such as data center takeout.

Marc Perlman: Capabilities that support remote or non-brick-and-mortar care are growing in use and importance, such as wearable AI and sensors that can passively monitor and collect clinically relevant data—a drop in blood glucose level or heart arrhythmia, for example—and alert contact center staff for follow-up. Clinicians are also leveraging mobile apps, virtual reality/augmented reality (VR/AR), customer relationship management (CRM) and data analytics to provide a 360-degree of patients with personalized omni-channel engagement. These technologies create a new safety net while extending the care a person receives from the most appropriate provider.

Eric Foote: Regulatory frameworks will be very important as we move to next-level digitization. For instance, putting your EHR on cloud provides flexibility and cost/operating efficiencies but can also create data ownership and security challenges: Who controls which data can be shared? Where is the data physically housed? In the United States it doesn't matter where the data resides as long as the cloud provider has the proper amount of latency and responsiveness. In other countries, by contrast, data cannot reside outside their borders so the cloud provider has to be either a local data center, an on-premises operator, or a hybrid, in-country public-private cloud.

Questions/actions health care leaders should consider for 2022



What are some 'no-regret moves' that health care systems can make to support the convergence of digital transformation and health care delivery models?

Bold plays in digital can help health systems solve a range of clinical and operational challenges and unwrap opportunities to move them along the path to the Future of Health. We suggest taking a three-prong approach: Use what you have, buy or partner for what you need, and automate repetitive processes. For instance, health systems can move non-core functions—training databases, testing environments, and disaster recovery backups—to the cloud; that way you learn how to work with the capability, and, over time, you'll be able to migrate mission-critical systems there. They also should look at automating routine processes; for example, EHR system testing, because doing so can provide cost-efficient scalability for the future. Among no-regret moves to consider:



Invest in 5G infrastructure, including in remote regions. Implementing and scaling roll-out of 5G infrastructure can enable more reliable and timely access to services, especially for remote populations. Consider setting up an independent 5G- and Edge computing-focused organization—one that sits outside of the primary business's controls and capital deployment processes—to test, apply, and grow these capabilities.



Move contact centers to the cloud. Moving legacy call center operations from old technology stacks to the cloud can improve customer engagement and streamline issue resolution. Traditional health system and health plan call centers often limit organizations' ability to deliver efficient and cost-effective care and retain patients/members. Moving operations to the cloud creates a secure and compliant omnichannel contact center platform with conversational AI and automation, complemented by an integrated ecosystem to deliver an enhanced customer experience.



Create a delivery system without walls. Shifting from inpatient visits to more outpatient and digital management can transform how care is delivered. Health systems' inability to integrate patient care inside and outside the hospital may result in disconnected care delivery and inefficient use of time, equipment, and resources. Creating an integrated platform connected by a digital control tower with proactive AI capabilities can optimize the flow of patient data and increase clinician and resource efficiency to enable care delivery across physical boundaries.



Strengthen interoperability and connectivity. Selecting interoperable, future-focused digital solutions and driving data collection, aggregation, and connectivity—across traditional (institutional) and non-traditional (wearables, retail) sources—can provide the capabilities and flexibility health systems need to deliver the right care at the right place at the right time.



Broaden the concept of partnering. Forming intra- and cross-industry partnerships and alliances can provide access to the expertise, data, capabilities, experience, investment, and scale a single organization might lack. No health system, public or private, possesses a complete set of digital transformation tools. Technology giants have the tools, but they lack deep health care industry knowledge. Broadening the concept of partnering beyond the traditional health care ecosystem to include disruptive startups, technology hyperscalers, and private equity/venture capital firms can open doors to cost savings, operational efficiencies, improved care access and affordability, strengthened data security and cyber controls, and clinical innovation to improve population health outcomes.



Future of medical science

Medical science is currently being transformed by scientific discoveries that will dramatically advance the way we diagnose and treat different diseases. Breakthroughs in digital medicines, nanomedicine, genomics, microbiometrics/metabolomics, and others are occurring at an unprecedented and exponential pace, building on transformed clinical trial structures and timing, disruptive market entrants, and increased consumer participation.

Also shaping the future of medical science is the health ecosystem's exponentially increased capacity for data capture and analysis. Organizations are using insights derived from interoperable data and platforms supported by deep learning capabilities, "always on" biosensors, and behavioral research to shape consumer beliefs and actions. They are also applying virtual care, artificial intelligence (AI), and other technologies to personalize medicine, enable real-time care interventions, and provide behavioral nudges.¹

Advances in medical science are being propelled by significant investment and research across the public and private sectors—government, biopharmaceutical companies, technology giants and startups, and academic institutions—bringing new innovations to the masses and driving more predictive, preventative, personalized, and participatory (4P) medicine.

Transformational innovations

Digital medicine—The last few years have witnessed a proliferation of digital medicine products, evidence-based software and hardware products that measure and/or intervene in the service of human health.² These include digital therapeutics (i.e., regulated products that employ software to deliver evidence-based therapeutic interventions) and digital companions (i.e., products that provide additional services and insights for patients to improve their experience, knowledge, and outcomes of their existing drug therapy). Among current examples:

- **Digital therapeutics:** AppliedVR is a provider of therapeutic virtual reality for pain management. Using head-mounted devices, the AppliedVR platform creates an immersive experience that helps people overcome their discomfort. Through gamification, patients learn evidence-based pain management skills and mindfulness strategies. Having been successfully used for acute pain in health care settings, the technology is starting to be used for chronic pain management at home, specifically for chronic lower back or fibromyalgia pain.³
- **Digital companions:** In 2020, Teva launched ProAir® Digihaler®, a sensor-laden albuterol dispenser pump for treatment and prevention of obstructive airway disease. The dispenser records and sends inhaler event data to the companion mobile app via Bluetooth. The app can use this data to instruct patients on their inhaler techniques or adherence. With patient consent, the app can share the data with their provider to inform treatment decisions and care management.⁴

Nanomedicine—Nanomedicine is the improvement and preservation of human health with the help of molecular tools, or nanotechnology.⁵ Promising applications include targeted drug delivery; nanorobots to detect and repair infections and body damages; controlled protein and peptide delivery; and gene therapy, in which the expression of a defective gene may be altered and corrected.⁶ The pharmaceutical industry is already engineering new molecules at nano-scale. In one example, NaNotics, a nanomedicine company, builds subtractive nanoparticles that remove specific disease-causing molecules from the human body. NaNots are injected into the body like a drug and modulate cellular behavior by depleting specific signal molecules or their inhibitors from blood—without disturbing normal cell signaling.⁷

Genomics—The field of genomics is a significant disruptive force that could redefine health care, and we are only beginning to tap its potential. The whole human genome was sequenced 15 years ago after more than a decade of research and at a cost of about \$2.7 billion.⁸ A patient's DNA can now be sequenced for a few hundred dollars in about a day.⁹ A person's DNA can help identify a predisposition to certain diseases; sequencing the genomes of multiple patients can provide researchers with a richer knowledge about diseases, which can help them develop more effective personalized therapies. Application areas include direct-to-consumer (DTC) genetic testing, cancer diagnostics and therapy, and gene editing. Advances in genomic sequencing could make it possible to use a blood test to identify traces of cancer DNA and the genetic mutations that cause it. A gene-editing platform could be used to reprogram the patient's immune system to identify these mutations and attack the cancer cells.¹⁰ Researchers in the United States and the United Kingdom have used genetic sequencing of the coronavirus genome to understand how it's changing, and then build on that knowledge at scale to improve COVID-19 vaccines so that they can respond better to delta and other emerging variants (see below).

Unlocking the power of mRNA vaccines and therapies¹¹

Vaccine developers are using a variety of technologies and techniques—from the tried and tested to completely novel approaches—to battle COVID-19 and prevent severe disease, hospitalization, and COVID-related death. The first vaccine to receive emergency use authorization in the US was a first-in-class synthetic messenger RNA (mRNA) vaccine,¹² making RNA a household term.

As background, DNA and RNA are the two naturally occurring varieties of nucleic acids, which are the main information-carrying molecules in our cells. DNA is a long, double-stranded molecule that stores the genetic instructions your body's cells need to make proteins. These instructions are translated from nucleic acid into protein through an intermediate messenger, mRNA. The mRNA carries that protein-encoding DNA information from the nucleus to the cytoplasm and activates the cell machinery to make fully functional proteins.¹³ Discoveries in the 1990s demonstrated that synthetic mRNA molecules can be used to deliver genetic information to the translational machinery to generate the encoded proteins. RNA technology can potentially be used for:

- **Replacement therapy:** mRNA is administered to the patient to compensate for a defective gene/protein, or to supply therapeutic proteins
- **Vaccines:** mRNA encoding specific antigen(s) are administered to elicit protective immunity
- **Cell therapy:** mRNA is transfected into the cells *ex vivo* to alter cell phenotype or function, and these modified cells are subsequently delivered into the patient.¹⁴

At present, most mRNA-based therapeutics are being used as vaccines against infectious diseases like COVID-19 or to develop personalized cancer vaccines.¹⁵ Ongoing research is also exploring whether this technology can be used as a protein-replacement therapy, particularly for rare diseases such as the blood-clotting disorder hemophilia.¹⁶ By February 2021, there were more than 520 clinical trials testing mRNA therapeutics across more than 20 disease categories with investment growing considerably.¹⁷

Artificial intelligence and big data—While drug discovery has led to many life-saving and life-enhancing clinical treatments, it is also a long, expensive, and often unsuccessful process, with many areas of unmet need. AI-enabled solutions are transforming the process and enabling the development of more precise targeted treatments. This is shifting health care toward a future where medicine is more personalized, predictive, preventative, and participatory.¹⁸

AI algorithms can extract concepts and relationships from data and learn independently from data patterns, augmenting what humans do. AI also helps cross-reference published scientific literature with alternative information sources. By mining such data, AI applications in drug discovery have already delivered new candidate medicines, in some cases in months rather than years.¹⁹

While current AI-enabled solutions are focused primarily on transforming the process of small molecule research, they are also showing potential in identifying new biologics such as therapeutic antibodies against cancer, fibrosis and other diseases. UK-based BenevolentAI is combining advanced AI/ML with cutting-edge science to interpret, classify, and extrapolate biomedical data; decipher complex disease biology; and discover new therapeutic interventions.²⁰ Alphabet Inc.'s AI research lab DeepMind Technologies announced in late 2020 that it has created software that solves the “protein folding problem,” a breakthrough that could solve one of biology’s biggest challenges and pave the way for a better understanding of diseases and new drug discoveries.²¹



Today we are using big data and applying AI to discover new science and feeding that science back to consumers in a virtuous loop of discovery. For example, COVID symptom tracking is providing data that is contributing to the science of vaccine development in real time and continually updating insights. It’s a continuous loop of science and consumers working together.



George Hadjigeorgiou, co-founder of health science company ZOE

Microbiometrics/metabolomics—Current medical approaches to address diabetes, heart disease, and other chronic health issues view weight gain as the problem, rather than a symptom of poor metabolic health. They also generally treat patients the same when, in reality, bodies are all very different. Startups including Viome²² and ZOE²³ (see sidebar) use data and AI platforms to analyze the interaction between food and an individual’s microbiome to develop precision nutrition programs, with the goal of improving gut health and reducing inflammatory responses caused by diet.²⁴

Trust your gut: Microbiome test uses AI/ML to create personalized dietary programs to reduce inflammation and improve gut health

An interview with George Hadjigeorgiou, co-founder, ZOE.

Health science company ZOE (www.joinzoe.com), named after the Greek word for 'life,' was founded in 2017 by Professor Tim Spector of King's College London, data science leader Jonathan Wolf, and entrepreneur George Hadjigeorgiou. The US- and UK-based startup combines large-scale human studies with artificial intelligence/machine learning technology and metagenomic sequencing to analyze individual responses to specific foods and provide a personalized nutrition program that can potentially help reduce dietary inflammation and improve gut health to unlock energy, manage hunger and weight, and enhance overall health. ZOE is also behind the hugely popular [ZOE COVID app](#), the world's largest ongoing study of COVID-19 with more than 5 million members that has helped to save lives.

Q: George, what do you think is driving the growing interest in gut health and the idea that every person's biology reacts differently to food? People have a right to understand how their body responds to food, to take control of their health, and to live a better life. All three of ZOE's co-founders had a personal journey around the impact of food on their health. I read about the topic, including *The Diet Myth*, Tim's book about gut microbes, which led me to a process of experimentation. In three months, I lost 15 kilos and dropped my cholesterol levels by 40%. I was shocked by that because I didn't realize that by changing my diet, I can have an impact on my weight and my metabolic health. We offer a very personalized program to help individuals do that.

Q: Following this program requires a lot of accountability on the consumer's part. Have you found that people that start the program remain engaged? How do you keep them motivated? We believe our approach is, by design, sustainable because it teaches people to be more aware of the impact of food on their body. We want them to understand the connection between what they eat and what happens in their gut and make it second nature: If you eat a certain way your body is going to act a certain way. There will be people who can master that and go on their own, others will master it but need extra support. For these people we provide coaches that help them stay engaged, learning, and accountable. We already see most of our members mastering these connections as in addition to weight loss they feel less hungry and more energetic and tell us that ZOE has changed their life!

Q: How does ZOE's feedback loop enable you to improve and evolve the program? We see ZOE as a platform that improves over time as our dataset and scientific studies expand. The data set we're building around the microbiome, "good" and "bad" gut bacteria, and the connection to and how people eat, live, and feel is the most comprehensive in the world. With more and more people joining the ZOE community and providing feedback on their experience, data becomes our core asset. We use the most advanced tests and cutting-edge science available to help people understand how their body works so they can reduce dietary inflammation and improve their gut health naturally.

Q. What are the challenges of scaling personalized products for the masses? Because the ZOE community is young but growing rapidly, the first challenge is being able to scale our operational abilities; to onboard customers, send tests, process the resulting data, and support members in our program with the highest quality. The second challenge is being able to personalize their program even more by accounting for an individuals' unique lifestyle so they can make best use of the program—and to repeat this process for increasing numbers of users. I think both of these challenges are solvable with technology.

Obstacles to innovation: Cost, scale, trust

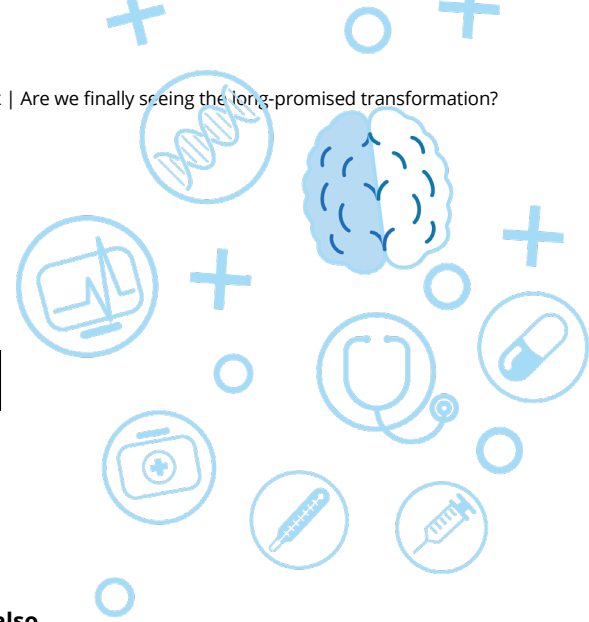
How do the health care and life sciences sectors overcome cost, scale, and trust issues to bring medical science innovations to the masses? The high R&D cost of new immunotherapies, digital medicine products, and precision/personalized medicine is a significant point of concern—especially in light of the already rising cost of health care diagnosis and treatment—and places many promising innovations beyond the reach of poor and middle-class sections of society.

Another challenge is developing business and operating models to tap into medical science opportunities at scale. There are many great ideas that are too impractical and/or expensive in their current form. How can innovations be translated from the academic into the practical at scale and at speed?

Finally, health care providers, insurers, and patients may be reluctant to engage with new medical interventions, even after they have been cleared by regulatory authorities. The COVID-19 vaccine hesitancy is a very recent example; there are many groups of people that don't want to engage with things of a scientific basis, including medicines and treatments. If you build it, will they come?



Questions/actions health care leaders should consider for 2022



How can scientific innovation help stakeholders control health care costs while also improving overall public health?

Medical science innovations continually shape and reshape the health care sector, shifting the focus toward prevention and well-being, moving care outside of health facilities, and putting consumers at the center of their own care. Even today, digital medicine products are beginning to transform health research and care models, and the COVID-19 pandemic has accelerated the process.²⁵ But scientific discovery, development and commercialization is expensive—especially for personalized therapies.

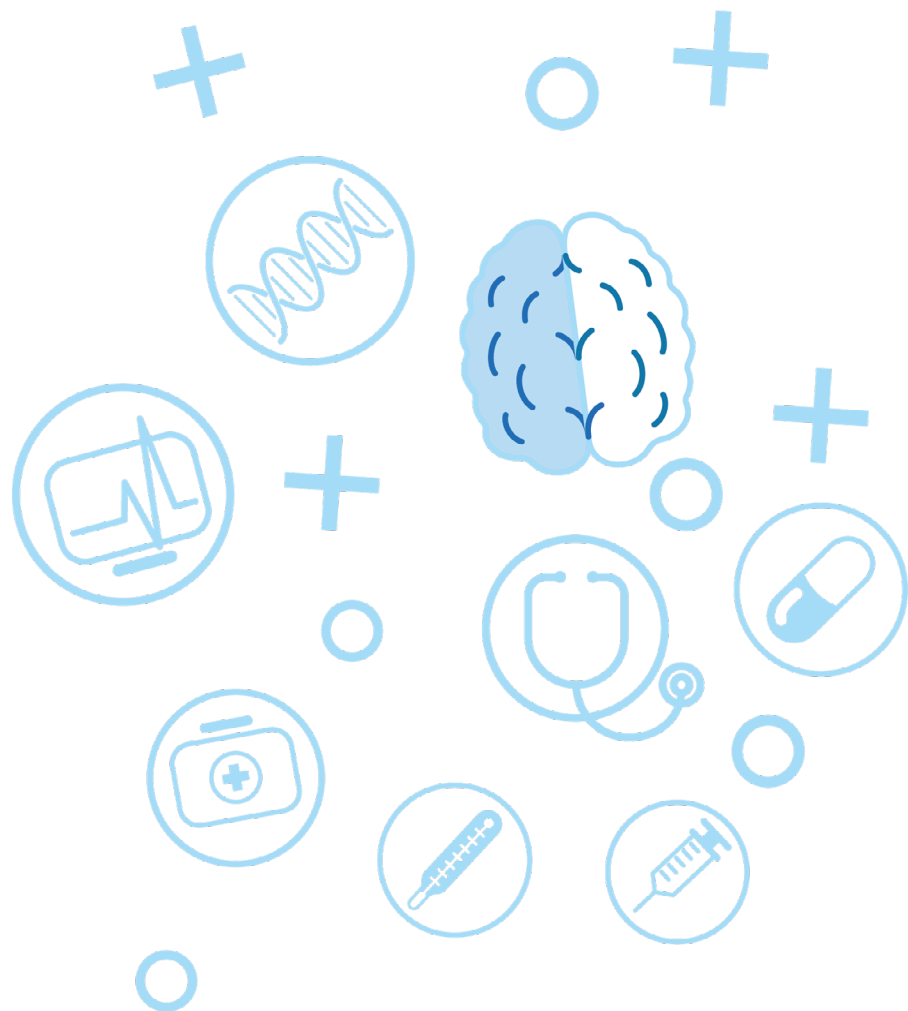
And health care is costing more and more each year. The following actions may help health care leaders balance the tremendous benefits of medical technology innovation with the practicalities of controlling health care spending.

Tap into consumer empowerment. More and more consumers are demanding access to data and tools that will empower them with knowledge and ability to understand what's happening with their bodies, make informed health decisions, and take appropriate preventative and/or therapeutic actions. Smartphone technology, over-the-counter diagnostic tests, and personalized health data are democratizing medical science and putting more power—and responsibility—in consumers' hands. Already, we can measure our DNA, microbes, blood sugar levels, exercise, and sleep patterns. And we are applying new technologies to make sense of, expand, and leverage this data in a virtuous loop that continuously updates the science. Digital medicine products, for example, offer the opportunity to influence patient adherence and outcomes, better understand the patient experience of disease, and generate real-world data that is relevant to customers. A growing number of biopharma companies, large technology players, and digital health startups are introducing innovative digital medicine products to enable patients to take greater control of their health.²⁶

Making it easy for empowered consumers to experience medical innovations first-hand is an important driver of adoption. Ochsner Health's O Bar, located in the health systems' facilities throughout Louisiana (there's also a mobile version), offers the latest in cutting-edge, interactive health technology to help consumers seamlessly manage their health and wellness. The O Bar's full-time technology specialist helps consumers select and set up the digital products or apps they need to participate in Ochsner programs such as digital medicine, which helps patients manage their high blood pressure and/or Type 2 diabetes from home while staying connected to a dedicated care team. The O Bar sells a variety of physician-recommended products, such as activity trackers, wireless blood pressure monitors, and scales. They also feature a state-of-the-art iPad® bar that allows patients to test drive more than 100 Ochsner-approved health apps that focus on wellness, nutrition, fitness, diabetes, women's health, smoking cessation and more.²⁷

Establish health system innovation hubs. The biopharma industry has long used innovation hubs as incubators for medical science advances that, biopharmas hope, will become future revenue-generators. Now health systems are modeling the practice. Ireland's first health innovation hub, launched at University College Cork, is a partnership of clinicians, academics, innovators, and entrepreneurs from across Ireland to accelerate health care innovation and commercialization, improve outcomes for patients, and create jobs and exports for Ireland.²⁸ In the United States, the Henry Ford Innovation Institute (HFII) in Detroit, Michigan, provides Henry Ford Health System innovators access to an array of intellectual asset-related resources and programs that include technological opportunity assessment, engineering services for prototypes, seminars designed to convey opportunities, programs aimed at developing specific medical products and broad educational offerings in the realms of translational medicine and the entrepreneurial arts. The Institute is organized as an independent scientific research and educational entity, allowing it to operate flexibly and rapidly. HFII's operating philosophy is simple: Use innovation to improve health care and the patient experience.²⁹

Explore collaborative funding and development models. Companies are experimenting with various business and operating models to offset the considerable expense and time involved in developing, obtaining regulatory approval, and commercializing medical science innovations. For example, pharma companies are partnering with technology companies, consultancies, and digital health startups to access the expertise to build digital medicine products. Internal teams from biopharma companies (where the digital function exists) assess the tech landscape to identify potential partners that best suit their needs.³⁰ Partnerships can involve access to a propriety technology platform that is often TA-specific. For instance, BMS has partnered with Voluntas to use its Theraxium Oncology platform to build a digital companion for self-management of symptoms related to cancer therapy.³¹ Sanofi partnered with an established mental health digital therapeutics firm, Happify Health, to build a digital therapeutic to help multiple sclerosis patients manage anxiety and depression.³² Technology companies are likely to remain important partners for biopharma as a source of expertise and innovation in medical science products.





Public health reimaged

The COVID-19 pandemic has shifted the dynamics of public health. The scope and persistence of this global crisis have exposed vulnerabilities in countries' public health systems and impacted their ability to effectively detect and respond to the continually shifting emergency in a multidimensional way that could have mitigated its impact. Despite some successes (New Zealand and South Korea, for example), many nations' systems for disease surveillance, outbreak management, and contact tracing and tracking have proved inadequate for the scale of the pandemic's initial and subsequent outbreaks. The public health workforce has been placed under significant, prolonged pressure, resulting in widespread burnout and post-traumatic stress—especially in countries where workforce shortages were already an issue pre-pandemic—exacerbated by difficulties in contact tracing, data collection and analysis, mass vaccination planning, logistics, distribution, and storage.

At the same time, the pandemic is acting as a catalyst to reimagine the future of public health: It is about the health of the population, not an individualistic model. The pandemic has awakened government, industry stakeholder, and consumer awareness of public health systems' inherent challenges and broadened understanding that achieving drastically improved health outcomes requires systemic change and cross-sector coordination.¹ Challenging forward progress—in addition to the ongoing pandemic—are the growing threat of climate change and pervasive inequities that threaten individuals' health, longevity, and trust in government.²

The pandemic has ignited growing recognition of the need to invest in population health. We are only as strong as our most vulnerable populations, and early health promotion, detection, and intervention are essential to prevent, reduce, or delay the onset of chronic disease.

What is public health?

Public health is defined as “the art and science of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private communities, and individuals.”³



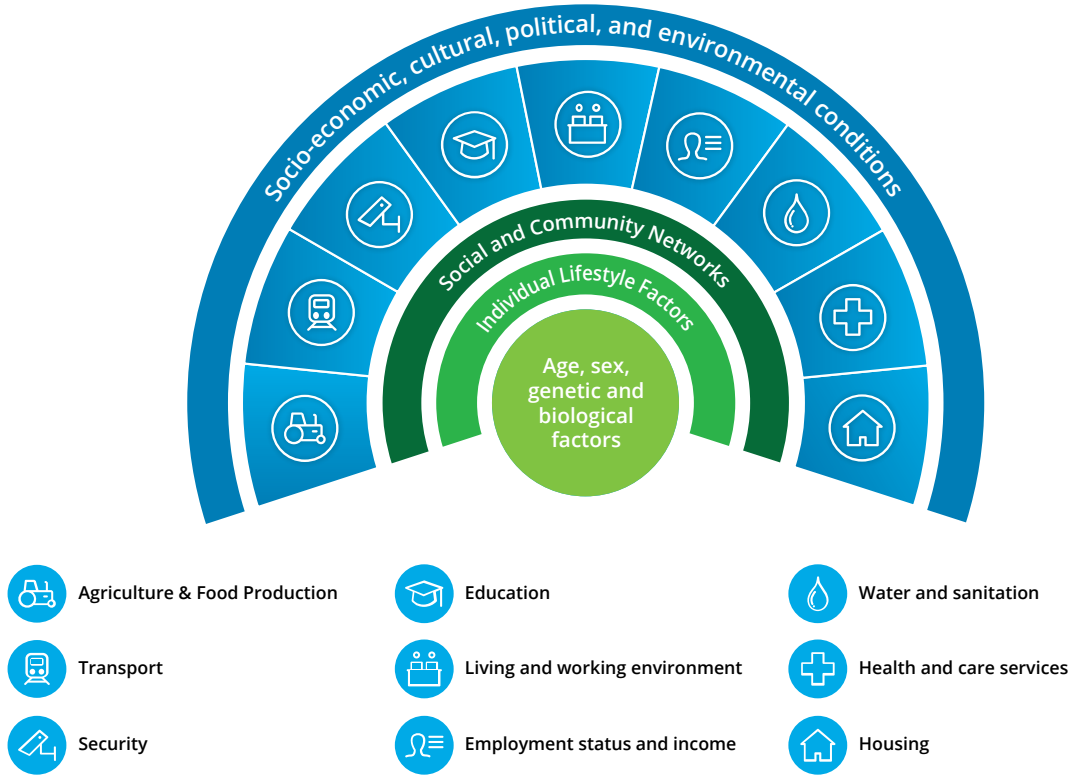
The funding conundrum

COVID-19 treatment delivery has been almost entirely borne by the public sector, and nearly all governments have or are expected to introduce public health policies and spend heavily in 2022 (and, likely, in subsequent years) to control the pandemic, broadly roll out vaccine programs,⁴ and offset its health- and economic-related fallout.⁵ The U.S. federal government, for example, has passed several pieces of legislation providing economic relief through a number of channels and programs, a large portion of which is targeted not just at responding to and recovering from the pandemic, but also toward overall modernization efforts in public health. The United Kingdom has reformulated its entire approach to public health, including creating new responsible organizations and enhancing integration of health and social care.⁶

The core mission of public health is to protect and promote the health of all people in all communities. However, adding COVID-related expenditures to public health's other challenges—climate change, health inequities, communicable and noncommunicable diseases, deteriorating infrastructure, and a global shortage of clinical workforce—will require new partnerships across public and private health care providers. It will also depend on disruptive entrants bringing new ideas and diverse skillsets, and new sources of investment to promote shared aims of prevention and wellness for communities. The latter would be a paradigm shift from the traditional emphasis on providing sick care for individuals⁷ that is expected to help improve outcomes and control and/or reduce system costs now and in the future.

A strong foundation for the future of public health will be dependent on whole-of-government approaches to care provision and collaborative, multi-stakeholder ecosystems.⁸ Thus, public health systems are working to navigate the challenges of linking community and clinical services to improve health outcomes in the long term;⁹ Italy's National Health Service is one example of public health-health care integration.¹⁰ Numerous studies suggest that between 30% and 55% of health outcomes are affected by social, economic, and environmental factors:¹¹ these social determinants of health (SDOH) include physical environment, food, infrastructure, economy, wealth, employment, education, social connections, and safety¹² (figure 1). Effectively tackling this will require integrated approaches to health, housing, education, transportation, and employment.

Figure 1. Social determinants of health



Note: Social determinants are known as the “causes of the causes” of ill health, and encompass the range of social, environment, political and cultural differences that directly or indirectly impact the health of individuals and populations; and are recognised globally as a core dimension of public health policy and practice and are central to action on health inequalities.

Source: The future of public health, Deloitte UK

Numerous countries are implementing innovative programs to move public health in the right direction. New Zealand has instituted a well-being budget based on the idea that gauging the long-term impact of policies on the quality of people’s lives is better than focusing on short-term output measures. The initiative is focused on aiding the transition to a sustainable and low-emissions economy; supporting a thriving nation in the digital age; lifting Māori and Pacific incomes, skills, and opportunities; reducing child poverty; and supporting mental health for all New Zealanders.¹³

Brazil established the Support Program for Institutional Development of the Unified Health System (PROADI-SUS), a collaborative of six private hospitals (Hospital Alemão Oswaldo Cruz, Beneficência Portuguesa de São Paulo, Hospital HCor, Hospital Israelita Albert Einstein, Hospital Moinhos de Vento and Hospital Sírio-Libanês) that aims to strengthen and develop their relationship with public health departments and meet the needs of the Unified Health System (SUS).

The United Kingdom’s planned reform of public health brings all health care providers into a new, geographically based Integrated Care Service (ICS) beginning in April 2022 and enhances integration of health and social care within the ICS structure. In addition, the plan will close Public Health England (PHE) and split its responsibilities across a new UK Health Security Agency (UKHSA) and the Office for Health Improvement & Disparities, part of the Department of Health and Social Care. The arrangement provides a unique opportunity to re-prioritize public health protection, prevention, and promotion services and address health inequalities in more coordinated and collaborative ways.¹⁴

Digital technologies are transforming public health systems

Numerous public health systems are reinventing themselves in the wake of COVID-19, and digital technologies—from targeted applications to entire smart cities (see sidebar)—are playing an important role in their transformations. While the challenge is enormous, so is the opportunity.

Digitizing public health and other government systems has emerged as a pressing issue in Japan, where the country's ministries and agencies have created siloed legal and regulatory systems, and an outdated information technology (IT) infrastructure has hampered data collection. A “digital agency” was established on September 1, 2021, to close the technology gap.¹⁵ In addition, Japan's health ministry put into full-scale operation an online system for citizens to use My Number social security and taxation identification cards as public health insurance cards.¹⁶ In addition, card holders will be able to access their personal health record (PHR), including medical history and check-up results. The centralized data will become available for industry use, creating needs for increased data security.

Germany has also lagged in health care digitization, despite having the world's second largest health care market after the United States. The pandemic highlighted the importance of digital health and the need to modernize the country's hospital system.¹⁷ In response, the federal parliament passed the Hospital Future Act (KHZG) to provide significant funding (US\$ 4.3 billion) to close the digital gap. Potential projects include patient portals, digital medication management, IT security measures, telemedicine, robotics, and cross-sector telemedical network structures.¹⁸

In China, government policies, markets, the pandemic, and new technologies are promoting the digitalization of public health services including medical care, health insurance, health monitoring, online consultations, diagnosis, prescriptions, payment, and reimbursement. 5G telecommunications, leveraging the ubiquity of mobile technology use—China has the largest number of mobile telecom users in the world with 1.2 billion subscribers, 239 million of which use health-related applications or services¹⁹—is anticipated to be a key contributor to public health service and innovation.

While Southeast Asian (SEA) countries' public health systems have varying resources at their disposal, it became clear during the COVID-19 crisis that a coordinated regional response is needed to manage future pandemic threats. With support from the United States Agency for International Development (USAID), the Association of SE Asian Nations (ASEAN) is establishing the Public Health Emergency Coordination System (APHECS). This new multi-year multi-country initiative will integrate existing but disparate systems and mechanisms under a single, cohesive institutional platform to better prepare for, and respond to, public health emergencies.²⁰





Smart cities can make health care smarter

Smart cities have moved from vision to reality, and are already helping to improve citizens' health and quality of life, solve key urban challenges, and create safe and sustainable surroundings.²¹

A smart city is a technologically modern urban area that uses information and communication technologies (ICTs)—embedded sensors, metering devices, cameras, and other monitoring technologies—with big data processing and artificial intelligence (AI) to collect specific data to help manage public assets, resources, services, and spaces.²² A smart city can make health care smarter when systems and data are integrated and interoperable across core health, human services, and non-health sector services, including public safety, environmental health, social services, emergency services, and transportation. This can help enable real-time response to health crises, address inequities around the social determinants of health, and support the interconnected health and wellness goals of communities across the globe.²³

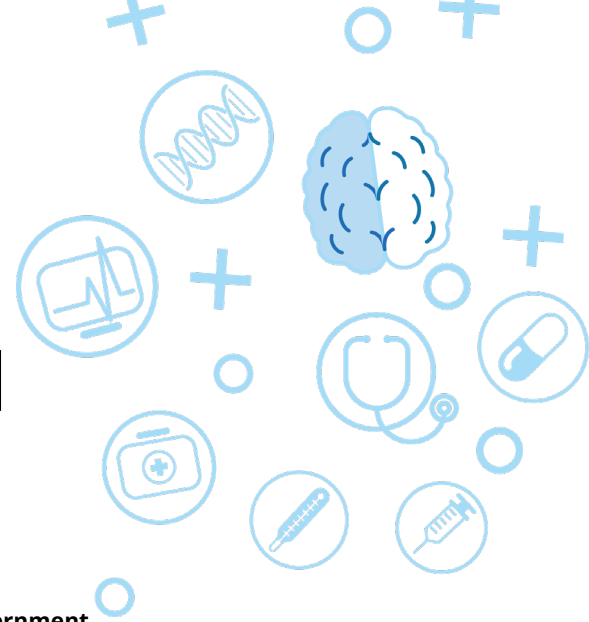
The most exciting aspect of smart cities is that they provide a blank canvas to reimagine public health, integrate well-being into urban design from the outset, and proactively address the social determinates of health care. A number of countries are at the forefront of smart cities development:

- **China** has become a global leader in smart cities initiatives, elevating development to a national strategy and allocating extensive government resources into furthering its growth. The nation reportedly has nearly 800 smart cities pilot programs underway or in planning, which would total more than half of the total smart cities around the world.²⁴ Municipal authorities charged with smart cities development commonly cite transportation, public services, public safety, education, health care, and environmental protection as project focus areas. Shanghai, Beijing, Guangzhou, Xi'an, Yinchuan, and Hangzhou are notable examples of older urban areas that have received smart city makeovers. In Hangzhou, a smart city system designed by Chinese tech giant Alibaba called "City Brain" has been in use since 2016.²⁵ China's central government is also promoting its smart cities technologies abroad.²⁶
- **The United Arab Emirates** is an early and prolific developer of smart cities. Masdar City in the emirate of Abu Dhabi was launched nearly a decade ago as the first smart sustainable city in the UAE and among the first in the Middle East region.²⁷ Dubai, UAE, has transformed itself into a model smart city in just three years, revolutionizing the way government services are delivered to residents by launching over 100 smart initiatives and more than 1,000 smart services by two dozen government departments and private sector partners. Its vision is for Dubai to be "the happiest city on earth."²⁸ One of the six targets of the Smart Dubai 2021 initiative is an interconnected society with easily accessible social services, which includes "improving individuals' quality of life by embracing technology to streamline social, cultural, education, and health care experiences in the Emirate."
- **Saudia Arabia** is building a futuristic, mega-city called NEOM or "New Future," in a desert bordering the Red Sea. Covering a total area of 26,500 kilometers/10,200 square miles, NOEM will incorporate smart city technologies and also function as a tourist destination. The state has pledged at least \$500 billion for the project, and is soliciting further investment. One of the infrastructure projects under development at NEOM is THE LINE, a 170-kilometer belt of hyper-connected, AI-enabled communities, without cars and roads, powered by 100% clean energy, and built around nature.²⁹ All essential daily services—schools, medical clinics, recreational facilities, and green spaces—will be within a five-minute walk. Ultra-high-speed transit and autonomous mobility solutions will make travel easier and give residents more time to spend on their health and well-being.³⁰ THE LINE's carbon-free energy system will provide pollution-free, healthier, and more sustainable environments for residents.³¹

Smart cities require infrastructure modernization—and that typically takes time and comes with a high price tag. Innovative financing strategies are helping national, state, and municipal governments transform their smart city vision into reality.³² Many smart programs use a variety of public and private funding mechanisms to cover costs. Indeed, taking a community-based approach galvanizing public-private partnerships and other community assets is key to achieving smart transformation goals.³³ Public funds such as bonds or grants often provide the initial funds, with private sector funding such as loans, private equity, and philanthropy also viable funding sources.

The expansion of smart cities and their attendant technologies is expected to have major economic, health, and social impacts as troves of data are collected and used to improve the efficiency of government operations and individuals' daily lives. Still, where and in what ways countries and municipalities use the data that smart cities collect is a concern. Technologies that gather and synthesize real-world, real-time personal data can easily be used to threaten personal privacy or even national security.³⁴ Robust data security and governance will be essential elements of smart cities blueprints.

Questions/actions health care leaders should consider for 2022



COVID-19 has produced unique opportunities—both in public attention and government financial support—to confront longstanding issues underlying public health. How can stakeholders capitalize on current momentum to reimagine public health for the future?

Public health systems face persistent clinical, financial, and technology challenges across the service ecosystem—all exacerbated by heightened demand and skyrocketing costs during the pandemic—with a net impact of underserved clients and uneven outcomes across the range of support for vulnerable individuals and families. There is an unquestionable need to reimagine and transform struggling and constrained public health systems into ones that are human-centered, inclusive, and resilient to future shocks. The following steps could help organizations advance toward a more sustainable future:

Strengthen existing and establish new models of collaboration across professional, institutional, and organizational boundaries. Public health systems should work closely with the private and nonprofit sectors, although public health agencies do not need to be at the center of all activities in the ecosystem that improve health outcomes. Public health leaders can begin by assuming the role of convener, nurturing new and budding relationships with ecosystem partners to improve processes and innovations, as well as strengthening collaborative infrastructures across offices and agencies.

Clearly articulate a shared value proposition. Shared value is created by cross-sector investment in public health and based on timely and transparent evaluation and measurement of public health initiatives. Public health communication will be critical to defining shared value, and community co-design will generate shared stewardship and strengthen trust. Public health leaders can quantify the business case for public health investment, include community members in public health decision-making from the start, combat mis- and disinformation like it is a national security threat, and borrow from the commercial sector to employ effective communications strategies.

Align funding and incentives with prevention, health promotion, and wellness. Public health funding models should include mechanisms to streamline the current patchwork of government support, private equity funding, social impact investing, public health trusts, community development financial institutions, and environmental, social and governance (ESG) investments. Public health leaders can start by leveraging existing and untapped funding sources, incentivizing provider and insurer investment in prevention, and capitalizing on next-generation financial investment models that could promote health.

Share data across sectors, in real time. Public health data systems should enable cross-sector, real-time data-sharing, with public health data sets forming longitudinal data that cuts across public health concerns. A country-level vision should articulate the architecture and data standards, with regional/municipal data governance organizations overseeing traditional, nontraditional, and self-reported data collection. Public health leaders can join growing networks to enable real-time data sharing, leverage existing research tools, and extend the reach of current resources through automated technology.

Center future public health around health equity. Achieving health equity requires closing the opportunity gap, placing equity at the center of public health aims, incorporating health equity measures into public health initiatives from the start, and infusing diversity, equity, and inclusion (DEI) into all aspects of the workforce. Public health leaders cannot tackle equity alone; however, they can kickstart efforts by empowering community partners to lead change, building health equity metrics into funding and national guidelines, and galvanizing communities to advocate for equitable fiscal policy as a public health imperative.

Contacts

Author

Stephanie Allen

Deloitte Global Public Health Care & Social Services Leader
steallen@deloitte.com.au

Global contacts

Ashleigh Theophanides

Africa Life Sciences & Health Care Industry Leader
Director, Africa Deloitte Health Equity Institute
Deloitte Africa
atheophanides@deloitte.co.za

Asif Dhar, M.D.

U.S. Life Sciences & Health Care Industry Leader
Deloitte United States
adhar@deloitte.com

Bonnie Rowe

Director, Deloitte Access Economics
Deloitte Australia
bonrowe@deloitte.com.au

Charu Sehgal

Life Sciences & Health Care Industry Leader
Director, India Deloitte Health Institute
Deloitte India
csehgal@deloitte.com

David Betts

Public Health Transformation Leader
Deloitte United States
dabetts@deloitte.com

David Rabinowitz

Senior Manager
Deloitte United States
drabinowitz@deloitte.com

Elizabeth Baca, M.D., M.P.A.

Specialist Leader
Deloitte United States
ebaca@deloitte.com

Eric Foote

Health Care Cloud Leader
Deloitte United States
ericfoote@deloitte.com

Greg Reh

Deloitte Global Life Sciences &
Health Care Industry Leader
grreh@deloitte.com

John Haughey

Global Consulting LSHC Industry Leader
Deloitte United Kingdom
jhaughey@deloitte.co.uk

Karen Taylor

Director, Deloitte UK Centre for Health Solutions
Deloitte United Kingdom
kartaylor@deloitte.co.uk

Kulleni Gebreyes, M.D.

Deloitte US Health Care Sector Consulting Leader
Director, US Deloitte Health Equity Institute
Deloitte United States
kugebreyes@deloitte.com

Marc Perlman

Global Health Care Digital Transformation Leader
Deloitte United States
mperlman@deloitte.com

Dr. Rohan Hammett

Asia Pacific Health Care Leader
Deloitte Australia
rhammett@deloitte.com.au

Sara Siegel

Public Health Care Sector Leader
Deloitte United Kingdom
sarasiegel@deloitte.co.uk

Victoria Chantra

Climate Change Director
Deloitte Australia
vchantra@deloitte.com.au

Wendy Gerhardt

Senior Manager, US Deloitte Center for Health Solutions
Deloitte United States
wgerhardt@deloitte.com

Will Symons

Sustainability & Climate Change Leader, Asia Pacific
Deloitte Australia
wsymons@deloitte.com.au

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