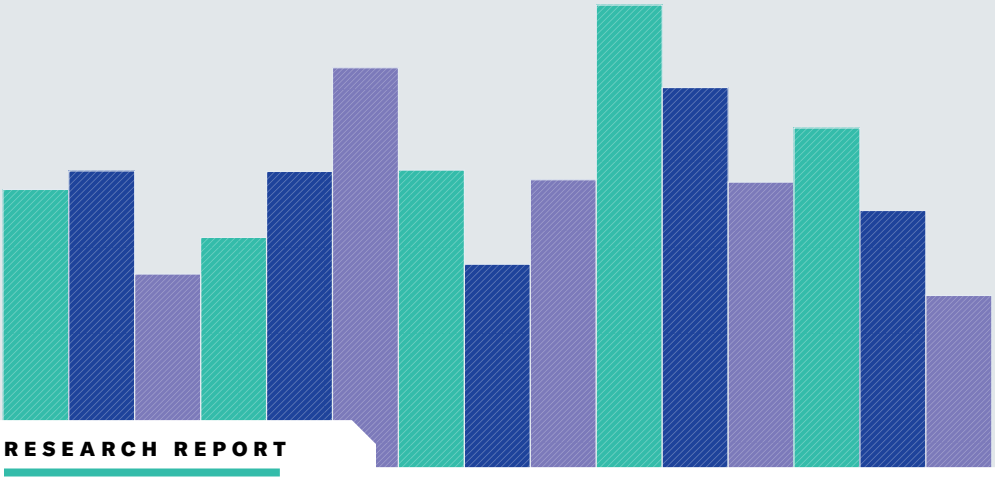
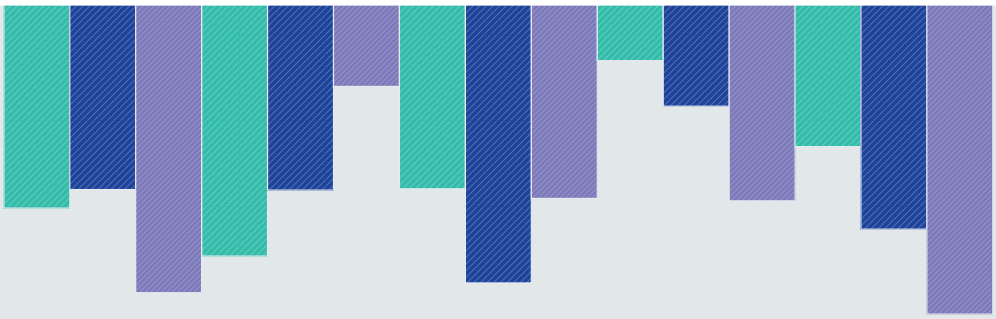
Harvard Business Review
ANALYTIC SERVICES



RESEARCH REPORT

Innovation in Data-Driven Health Care



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With today's introduction of advanced digital technologies, there is a significant opportunity to transform health care. The vision is that by connecting diverse data points, clinical insights will be generated that help improve patient care, population health, and the ability to identify disease at its earliest stages. For health care settings, connected operational data can also generate valuable insights to realize time and cost efficiencies, improving the overall clinician and patient experience in other important ways.

At the center of the opportunity to transform the diagnosis, treatment, and prevention of diseases stands the discipline of laboratory medicine, which analyzes the test results of an individual's clinical samples to determine health status. Over the past 125 years, Roche has grown into one of the world's largest biotech companies as well as a leading provider of in vitro diagnostics and transformative innovative solutions across many disease areas.

Every day, we work with leaders in laboratories and hospitals worldwide to ensure tests that inform decisions about an individual's health status are scientifically accurate and adhere to rigorous standards of quality control. In 2022, 29 billion tests worldwide were performed with Roche Diagnostic products, delivering crucial information on disease prevention, diagnosis, and treatment.[1]

At Roche, we are also introducing new digital technologies at every step of the patient care continuum—prevention, diagnosis, treatment, and monitoring of health and disease. With high worldwide incidence of diseases such as cancer and heart disease, early detection and treatment can become crucial factors for improving patient outcomes and survival rates as well as reducing costs and relieving human suffering. Because health care is complex and local to every country, we also believe it takes everyone working together to solve these challenges. The recent pandemic highlighted the importance of collaboration to connect data for prevention and treatment efforts. It also revealed the current gaps in health care—data and system interoperability challenges—a remaining pain point also highlighted by this report.

The creation of open digital ecosystems is one approach being used by Roche to address interoperability and to ease data access using the latest innovations. As strategic partners, we are bringing tech companies and health care leaders together to address the unique needs and priorities of health care while creating solutions based on flexible, scalable ideas and principles. With our multidisciplinary teams from health care and technology, we aim to bring worldwide best practices and knowledge to local health systems and to a wider population. To ensure that digital innovations and the data they generate are used accurately, responsibly, and ethically in health care, we are taking a holistic and science/health-based approach at Roche, aligning carefully with data privacy, government, and other regulations, that puts patient needs at the center of care.

Finally, the introduction of digital health solutions represents a significant step toward early detection and prevention of disease in an operationally efficient way. With their accuracy, accessibility, and affordability, we firmly believe that digital technologies have the potential to transform health care by using data in the service of better patient care.

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1 Roche Annual Report 2022, page 17 and page 35, https://www.roche.com/investors/annualreport22/#c56c7547-02d2-4bfd-8ba7-f1b4f17fd2eb

Innovation in Data-Driven Health Care

Innovative uses of data in health care are helping solve the most challenging problems in patient health and operational efficiency. Today, many health care organizations understand that a data-driven approach can improve patient health outcomes, enable faster clinical decisions, and improve treatment and hospital workflows.

These benefits of data-driven health care are widely understood and prioritized today. In January 2023, Harvard Business Review Analytic Services conducted a global survey of 757 members of the *Harvard Business Review* audience who work in the health care industry or in a health care–related industry and are familiar with their organization's use of health data and digital technologies for research, diagnosis, and/or treatment decisions. The survey finds that 94% of respondents agree that data-driven health care creates new opportunities for patients and doctors to benefit from more personalized health care approaches. Seventy-four percent of respondents say their organization has spent more effort on its approach to data integration/interoperability in the past three years, and 72% say their organization has spent more effort on its approach to data strategy.

Despite this stronger focus on data, most organizations continue to fall short of data-based decision-making maturity: just 16% describe their organization as mature in this area. Mature organizations, which are defined in this report as leaders, are able to access, integrate, and analyze data from diverse sources and make decisions quickly. Maturing organizations, defined as followers, have mostly digital data—the electronic presentation of information in a format or language that machines can read or understand—but there are still gaps in the workflow that slow down diagnosis and decision making. Followers comprise 56% of respondents. Immature organizations, defined in this report as laggards, use some electronic systems or technology to collect and manage

HIGHLIGHTS

94% of respondents agree that data-driven health care creates **new opportunities for patients and doctors** to benefit from more personalized health care approaches.

64% of respondents agree that **digital technologies** for health care have **made data integration easier**.

43% of respondents say one of the **greatest inhibitors** of becoming more data driven is **disconnected or incompatible systems/data**.

Due to rounding, some figures in this report may not add up to 100%.

data, but there's no easy way to identify and pull together relevant data quickly. Twenty-eight percent of respondents are categorized as laggards. **FIGURE 1**

The number of mature organizations has changed only nominally over the past four years: in a Harvard Business Review Analytic Services survey of 742 health care leaders conducted in 2019, 15% described their organization as mature in this capacity.

Certain challenges are standing in the way of health care organizations becoming more data driven. Disconnected or incompatible systems and data are making integration and interoperability difficult or impossible. Organizational silos are inhibiting collaboration, and funding challenges are obstructing innovation and critical infrastructure updates that support emerging data capabilities. A lack of analytic skills among frontline professionals and concerns about data security are also factors stalling progress.

As health care organizations continue to accelerate their use of digital health tools, there's an urgency to prioritize improved data capabilities. This report explores the data and technology impacts of the past four years on health care organizations, how they are managing clinical and operational data across settings today, new and persistent challenges that organizations are experiencing, today's enduring privacy and security concerns, and how health care organizations are activating the insights derived from data to meet operational and clinical challenges.

"You can't run a profitable health care organization without leveraging data in novel ways. You can't see patients you need to see without leveraging the data of the past to find care journeys that are optimal for patients in the future. And you can't reduce burnout in your clinicians unless you are looking at the data to determine what clinician needs to see what patients," says John Halamka, MD, president of Mayo Clinic Platform.

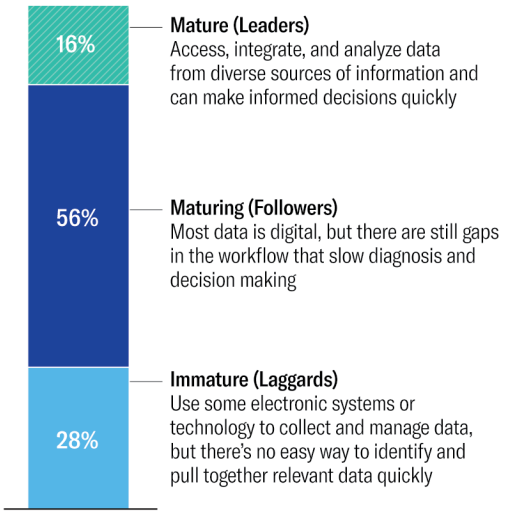
"You can't run a profitable health care organization without leveraging data in novel ways. You can't see patients you need to see without leveraging the data of the past to find care journeys that are optimal for patients in the future. And you can't reduce burnout in your clinicians unless you are looking at the data to determine what clinician needs to see what patients," says John Halamka, MD, president of Rochester, Minn.-based Mayo Clinic Platform, a health care and technology innovation think tank. "This is why data is so critical."

FIGURE 1

Data-Driven Decision Makers

Just 16% of organizations are mature

Which of the following best describes your organization's maturity when it comes to making data-driven decisions today?



Source: Harvard Business Review Analytic Services survey, January 2023

Evolving Data-Driven Health Care

Health care organizations have withstood tremendous challenges over the past three years, emerging from the Covid-19 pandemic with improved data management strategies and clearer visions for boosting operational efficiency and productivity, enabling faster decision making, and enhancing customer satisfaction.

As all organizations strive to become more data driven, however, certain obstacles are inhibiting progress. Forty-three percent of respondents rank disconnected or incompatible systems/data as a top challenge organizations

face. Organizations are also challenged by a range of other factors, including insufficient funding (42%), organizational silos/lack of collaboration across the business (37%), and a lack of analytic skills among frontline professionals (33%). The top barrier cited by 40% of leaders and 44% of followers is disconnected or incompatible systems/data, yet the top barrier cited by 42% of laggards is insufficient funding. Each of these, excluding organizational silos/lack of collaboration across the business, has shown a slight increase since this same question was asked in an April 2019 survey of the *Harvard Business Review* audience. **FIGURE 2**

Digital technologies and partnerships are key to solving these challenges. While organizations are finding electronic medical records (EMRs) across institutions (49%), EMRs within their institution (46%), and in-hospital digital patient monitoring (34%) "extremely useful" among the data domains and tools they routinely use, they're also partnering with a number of external entities for capabilities like data analytics, artificial intelligence (AI), and machine learning (ML). For some, digital health care startups are filling a niche and supplying some of the most cutting-edge data capabilities.

As organizations embrace new partnerships and work to solve these challenges in pursuit of better patient health and operational efficiency, many are keenly aware of the data privacy and security risks that data integration and management can pose. Striking a balance between risk and reward while exploring new secure and innovative ways to access and share data will be key.

Digital Transformation Accelerates through the Pandemic

Health care organizations had been digitally transforming long before the start of the Covid-19 pandemic. As it swept across the globe in March 2020, organizations scrambled to put in place critical infrastructure, technology, and processes.

"Covid didn't just accelerate digital transformation—it pushed it off a cliff," says Philip Bradley, digital health strategist, validation and analytics services, at the Healthcare Information and Management Systems Society (HIMSS), a Chicago-based not-for-profit research and consulting company. "Health care organizations had been easing toward all these new technologies and models, and all of a sudden the land was gone beneath them," he says.

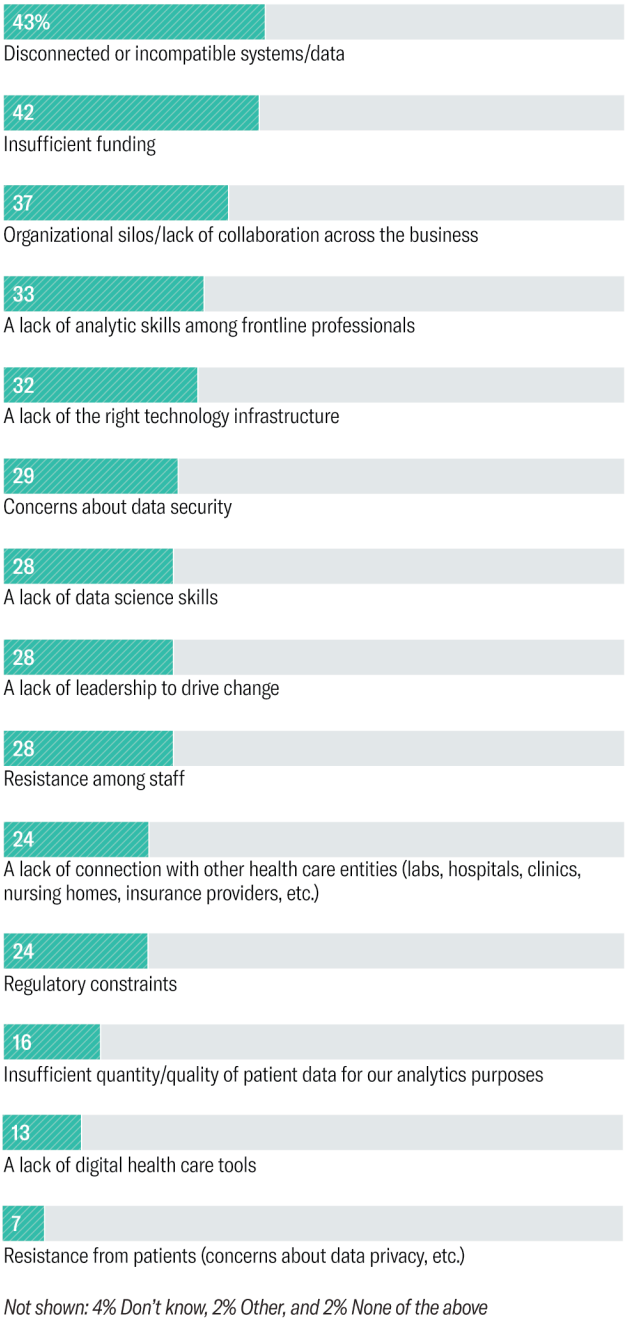
The sudden pivot from in-person care to telehealth drove change. Sixty-six percent of respondents agree that the pandemic allowed their organization to incorporate digital technologies that enabled better patient care from anywhere. Incorporating these digital technologies is a hallmark of leaders; 42% strongly agree that these technologies helped enable better care, compared with 24% of followers and 13% of laggards.

FIGURE 2

The Greatest Inhibitors of Becoming More Data Driven

Disconnected or incompatible systems are the top challenge

What are the greatest inhibitors to your organization's ability to become more data driven? [Select up to five.]



Not shown: 4% Don't know, 2% Other, and 2% None of the above

Source: Harvard Business Review Analytic Services survey, January 2023

"Covid brought us together. It gave us this notion that boy—unless we work together on problems, we're not going to make any progress. All that competitive angst across organizations melted away," says Mayo Clinic Platform's Halamka.

"We've had to figure out new ways to deliver care to our patients using digital means. We've had to figure out ways to accelerate our science and discovery programs using digital data. And we've had to deploy these programs in a way that is respectful to our patients, ethical, and focused on concepts like health equity," says Jeff Ferranti, MD, chief digital officer and senior vice president at Durham, N.C.-based Duke University Health System.

Ferranti says that before the Covid-19 pandemic, Duke University Health System provided care for an average of five to 10 patients a week via telehealth. Today, the organization sees approximately 5,000 patients weekly in this fashion. Evolving telehealth from what he calls a "project on the side" into what now accounts for more than 10% of its clinical volume wasn't necessarily simple.

"It's a completely different way to deliver care," he says. "We had to think about the data we needed to take care of those patients, how to investigate the efficacy of taking care of those patients, and whether telehealth is just as good as in-person visits—all these questions and uses of data came up."

These considerations prompted many organizations to implement new digital technologies, the survey finds. Fifty-seven percent of respondents say their organization adopted new digital tools during the pandemic for managing data, of which 31% say their organization significantly improved its operational insights. Among the 64% of leaders that adopted new tools during the pandemic, 49% say their organization significantly improved its operational insights. Comparatively, among the 59% of followers that adopted new tools during that time, 31% say their organization significantly improved its operational insights. Of the 50% of laggards that adopted new tools, 19% say their organization significantly improved its operational insights.

At Hospital Sírio-Libanês in São Paulo, Brazil, a hospital with 10,000 employees and 520 patient beds, clinicians needed a new way to triage patients seeking emergency care during the height of Covid. They developed and launched an app that prompts patients with a series of questions to gauge symptoms and pain level, for example, and then, depending on the responses, routes the patient to a telehealth visit, to a nurse for additional questioning, to a doctor, or ultimately to the emergency department.

Cesar Nomura, director of diagnostics at the hospital, says that this app was vital to managing the influx of patients during Covid and managing physician availability. "In Brazil, physicians don't just work at one hospital like many do in the U.S. Here, we have physicians that work in two, three, or four hospitals," he says. "So if we're able to separate the patients who truly need to see a doctor from the patients who can be seen via telehealth, that helps us to better manage things on the physician side."

The pandemic expedited the adoption of new digital technologies and enabled better patient care from anywhere. Fifty-six percent of respondents indicate that the pandemic accelerated data integration for their organizations, and 43% agree that because of the pandemic their organization was able to break down data silos. Leaders (52%), in particular, agree that their organization was able to break down silos because of the pandemic, more than followers (46%) and laggards (31%).

Mayo Clinic Platform's Halamka says these changes were born in part of necessity. "Before Covid, organizations didn't want to work with one another out of fear of loss of intellectual property or fear of data leakage," he says. "Covid brought us together. It gave us this notion that boy—unless we work together on problems, we're not going to make any progress. All that competitive angst across organizations melted away."

The pandemic also served as an impetus for health care organizations to examine the role of data and who has access to it, says David Rankin, director of clinical governance and informatics at Malvern, Australia-based Cabrini Health, a not-for-profit private hospital. Before Covid, data specialists at Cabrini Health provided management with the data that management thought was important, he says, which predominantly reflected its needs. This data included metrics like nursing hours per occupied bed, the overall complication rate, length of stay, and deaths.

"Management doesn't have the ability to change patient care, though. We've matured a lot now, and we're starting to give data back to frontline staff—the doctors, nurses, and allied health staff—who actually care for the patients and empower them to understand what can be changed," Rankin says. Putting this data into their hands has highlighted areas of improvement for clinicians.

Expanding access to data and digital technologies is important to health care organizations. Ninety-three percent of respondents agree that researchers, hospital/lab leaders, and staff want easy, integrated access to operational data, while 89% agree that providers increasingly want access to digital tools to help provide care to patients. The challenge is in integrating and managing these technologies and data.

Data Integration Challenges and Technology's Role

One lesson learned during the Covid-19 pandemic is that speed is of the essence, says Duke University Health System's Ferranti. "We don't have 17 years to come up with a vaccine or viable treatments. We've got to do things much faster and much more efficiently," he says. "That requires using our data in ways that we haven't traditionally used it before. We have an opportunity now to use multimodal data from a variety of sources—not just notes and data points from the [electronic health record], but also imaging, digital pathology, genomics, and social determinants of health data."

Using multimodal data—or data that spans different types and contexts—has been a primary focus for health care organizations since the start of the Covid-19 pandemic. Seventy-four percent of respondents say their organization has spent more effort on its approach to data integration and interoperability in the past three years. The top two reasons why: to improve operational efficiency and productivity (89%) and to enable faster decision making (67%).

"The question is, how do you take your institutional data assets that are sitting in warehouses around your organization and de-identify them and make them available so we can do research at scale and investigate problems, so instead of taking 17 years to develop a solution, it takes 17 days?" Ferranti says.

That's a scenario that few health care organizations have mastered. While 96% of respondents agree that managing health/clinical data across care settings—including labs, hospitals, doctors' offices, clinics, and patients' homes—is very important to the future of health care, only 25% indicate that their organization is very successful at it. Similarly, 89% of respondents agree that managing operational data across care settings is very important, while just 22% indicate that their organization is very successful at it. **FIGURE 3**

Health care organizations are encountering a range of factors that make data integration and management difficult, from varying data standards across systems to usability challenges. Australia-based Cabrini Health, for example, is contending with a lack of data standardization, which makes integrating data from various systems painstakingly complicated.

"Each developer uses their own data tables, data standards, and data processes," Rankin says. "When we purchase a very useful application and try to extract the data from the back end into our data warehouse so we can collate it up, it's a nightmare and an enormous amount of work. The lack of data standards around applications is almost crippling our ability to intelligently collect data."

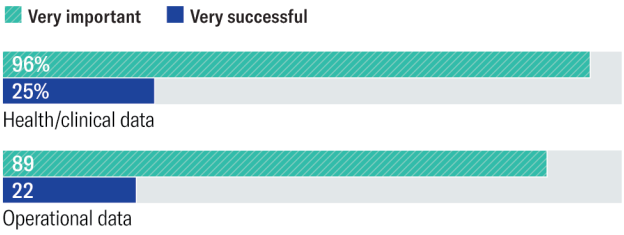
FIGURE 3

Managing Data across Settings Is Challenging

Disconnects exist between importance and execution

How important is it to the future of health care to be able to manage the following data across care settings (labs, hospitals, doctors' offices, clinics, patients' homes, etc.)?

How successful is your organization today at managing the following data across care settings (labs, hospitals, doctors' offices, clinics, patients' homes, etc.)?



Source: Harvard Business Review Analytic Services survey, January 2023

Health care organizations in the U.S. are facing similar challenges, Ferranti says. While there have been efforts to build standards that define data in a certain way, including FHIR—Fast Healthcare Interoperability Resources—it hasn't been enough. FHIR defines how health care information can be exchanged between different computer systems regardless of how it is stored in those systems, allowing health care information, including clinical and administrative data, to be available securely to those who have a need to access it. FHIR was established by Health Level Seven International, a not-for-profit organization accredited by the American National Standards Institute.

"There's a disconnect between the informaticians who create standards like that, the day-to-day technical teams, and users of that data," Ferranti says. "There's a steep learning curve that as an industry, we just haven't gotten over yet."

That's not the case everywhere, however. The National Health Authority in India, for example, announced the launch of the Unified Health Interface, a network of open protocols designed to enable discoverability and interoperable digital health service delivery, says Bhagwati Prasad, chief operating officer at the Koita Centre for Digital Health at the Indian Institute of Technology–Bombay in Mumbai. This network will enable patients and health service providers on different systems to seamlessly interact.

"Today, if a doctor has a patient with data at five different hospitals, it's not possible to access all that data at once because no one wants to share it and there are no protocols to share it," Prasad says.

Integration and interoperability challenges arise from other factors, too. At Penda Health, a primary and urgent care center with 380 employees across 19 branches based in Nairobi, Kenya, data integration difficulties stem from data quality problems and laborious—and sometimes pricey—data processes.

"Data quality problems happen when you have systems where users don't know how to enter data, the data isn't validated, or people are frustrated using it," says Rob Korom, Penda Health's chief medical officer. "Our current vendor is very willing to make changes, but it's expensive. All that data then has to go through an ETL [extract, transform, load] process which, because we're not the database developer for our [EMR], isn't a process we control." This creates limitations on their dashboard and on business intelligence capabilities, he adds.

Another challenge organizations face in data management and data interoperability is disorganized data, says Bradley of HIMSS. Physicians have more data now than ever before but aren't always able to make it actionable. "There are so many instances where they have all the data in the world but they have no idea what they're supposed to do for the patient," Bradley says. "Organizations have to take the time not only to integrate the data but do so in a way that's logical to the care provider team."

While data integration and managing data across settings has been a challenge, 64% of respondents agree that digital technologies for health care have made data integration easier, and 68% use software applications or tools to pull together data from diverse sources. This is especially true for leaders, as 81% say they use software applications or tools to pull together data from diverse sources, compared to 73% of followers and 52% of laggards.

More than half of respondents say their organization prefers that its digital solutions be evidence backed (67%) and medically certified (55%). Respondents say that their organizations prefer evidence-backed digital solutions for their evidence of value (73%), followed by their evidence of safety (66%). When it comes to medically certified tools, respondents say that their organizations prefer them primarily because of compliance with regulatory bodies (81%). Leaders (49%) are more likely than followers (31%) or laggards (35%) to say that it is an organizational requirement for digital solutions to be medically certified.

These software applications and tools that enable integration and interoperability are having direct impacts on clinical care and operations. Leaders that use these tools find electronic medical records across institutions (67%), electronic medical records within the institution (64%), in-hospital digital patient monitoring (48%), and digital tools for clinical decision support (46%) "extremely useful." In contrast, followers and laggards that use the same data and tools are less likely to say they are extremely useful—electronic medical records across institutions (49% for followers, 35% for laggards); electronic medical records within the institution (47%, 33%); in-hospital digital patient monitoring (35%, 22%); and digital tools for clinical decision support (24%, 26%).

At Duke University Health System, vital sign data, lab value trends, and blood test data are used in conjunction with ML capabilities to create Sepsis Watch, a tool that identifies patients who are at risk of developing sepsis about 72 hours before the signs and symptoms of it emerge.

"When [the system] sees constellations of signals coming together—maybe your heart rate is slightly elevated, your lactic acid is up, and your white blood cell count is higher than usual—the program looks at the risk profile, and if it triggers a certain level, it alerts the provider that a patient might be developing sepsis," Ferranti says. This feature enables the care team to administer antibiotics earlier, draw blood cultures sooner, and more closely monitor a patient to see if further care is needed.

These applications and tools that make data integration easier are also improving operational efficiency. At Kenya-based Penda Health, integrated data is used to manage patient wait times, Korom says. When a patient arrives at the clinic, the patient management system records the length of time the patient waits with the receptionist, at the nursing triage station, and for the doctor. This data provides a comprehensive view of the length of time patients are waiting versus being attended to and where those bottlenecks are occurring so management can put in place measures to reduce them. The clinic also relates that data to patient satisfaction scores, retention rates, and churn rates, he says.

Penda Health is also using integrated data to improve clinical quality, Korom says. "While the vast majority of our patients report clinical improvement of their urgent care issues, we noticed that within a few days there were some outliers that have reshaped our practice," he says.

By sorting outcomes data by diagnosis, Penda Health found that lower back pain was a common diagnosis with one of the lowest improvement rates. The clinical quality team discovered that while the diagnosis and treatment were generally appropriate, there was a gap in how team members were explaining what patients should expect for timelines of improvement. This discovery prompted new patient education materials aimed at this diagnosis, Korom says.

More-advanced health care organizations are including integrated data in their clinical decision support rules, Bradley says. If a patient is diagnosed with an allergy by a clinic down the street, for example, doctors at another location will see

64%

of respondents agree that digital technologies for health care have made data integration easier.

this allergy flagged if they try to order a medication that could cause a reaction.

"We're doing pretty well with connecting the wires—and we can always do better—but we're really inching toward that next step," he says. "How do we organize this wealth of data so doctors and nurses can use it better?"

Nurturing a Data-Driven Culture

While data integration, interoperability, and data management have posed challenges for health care organizations, culture and leadership have also been factors inhibiting data-driven initiatives. Organizations are contending with insufficient funding for their data projects (42%), organizational silos/a lack of collaboration across the business (37%), and a lack of analytic skills among frontline professionals (33%).

A common misstep fueled by silos and a lack of collaboration is adopting a "build it and they will come" mentality for new data efforts. In these scenarios, IT either builds data capabilities or purchases a solution without input from its end users.

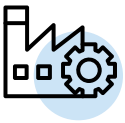
When systems are built without input, they simply won't get used, Ferranti says. "You can have the greatest data system out there and you can have great reporting, but if the people who are running units, running departments, and running clinical areas aren't using them, what use are they? That's not a technical problem; that's a culture problem," he says. "The projects I've seen go off the rails almost always do so because you have IT people doing things separate from clinical and operational people. You've got to have cross-disciplinary teams because it helps with adoption and thinking through things you might not otherwise consider."

Collaboration is also key in building trust around the data, Korom says. "We see challenges with people who say they don't really trust a KPI for one reason or another, and sometimes we have to address that to gain their trust," he says.

One KPI Penda Health tracks, for example, is the turnaround time for lab results. A timer begins when a lab technician opens a patient's chart to view the labs the patient needs and ends after the labs have been completed and the technician has entered the results in the system.

"Our lab techs quickly learned that they could game that KPI by asking the patient what labs they needed and opening their chart after they started running the lab, which made the turnaround time look even faster than what was feasible," he says. "As much as I'd love to use that as a core KPI in the lab, we had to revisit it to make sure that people were using the timing functionality in the way it was intended for that number to be trusted and actually have meaning."

As organizations aim to improve collaboration efforts, the hierarchy of priorities is similar to the one found when this same question was asked in a 2019 survey: communication from top management about the importance of collaboration (66% vs. 71% in 2019); process/redesign changes (66% vs. 70%); formal training to develop and practice new ways of working (56% vs. 54%); investing in new collaboration tools (53% vs. 51%); and formal change management programs (39% vs. 41%).



"You can have the greatest data system out there and you can have great reporting, but if the people who are running units, running departments, and running clinical areas aren't using them, what use are they?" says Jeff Ferranti, MD, chief digital officer and senior vice president at Duke University Health System.

Driving a data culture requires collaboration and trust, but equally important is having skilled frontline workers who are comfortable using data to drive decision making. As organizations look to the future, it's critical that health care teams prioritize the necessary training and upskilling to support new data advancements, Rankin says.

"There's an assumption that all physicians understand data and graphs because they're intelligent and curious, but not all do," he says. "Data scientists and informaticians just pump out this data and give it to physicians and think, 'Well, we've done our job.' But if they're not using the data because they don't understand it, what's the point?"

Building a strong data culture starts at the top with executives, boards, and management all buying into the value of data, supporting these projects, and understanding the infrastructure needs. For some organizations, however, the top is where many budget discussions end.

Conversations with administration around funding data initiatives have been one of the biggest challenges at Cabrini Health. "We bend over backwards to produce meaningful reports for management, but to develop a business case for why we need to redevelop our IT infrastructure, particularly data warehouses, is extraordinarily difficult at the moment," Rankin says. "Administration loves the reports, but they don't understand the infrastructure that's required underneath it."

Navigating this disconnect at the top is a challenge for many leaders, says Peter Daneyrd, MD, CEO of health care consulting

company Daneyrd Consulting, based in Stockholm, Sweden. "These investments are seen as a cost at the top, especially because it's not immediately apparent to them to what extent they will contribute to making health care better," he says.

Funding issues are also fueled by negative margins in hospitals, Halamka adds. It's rare that CEOs approach IT asking for algorithms or analytics dashboards; instead, they ask about new revenue streams, care models, and solutions for staff recruitment, retention, and burnout problems, he says.

All that said, funding issues, Halamka believes, are bound to reverse. "Now, post-Covid, the notion of using machine learning and workflows becomes an imperative because of the economic headwinds that these organizations are facing," he says. "We're starting to see more cooperation because there's more demand for these solutions than ever before."

The Role of Partnerships

Ferranti says outside expertise may be helpful in dealing with funding challenges that persist. "That's where I think there's increasing opportunity to work with industry partners who are really expert in some of the new technologies to make biomedical information more computable." As health care organizations continue to seek solutions for data integration and interoperability challenges, and as they progress toward becoming more data driven, partnerships with external organizations grow more important in other ways.

"Hospitals might have great clinical talent and a lot of wonderful data available in their systems, but they might not necessarily have the same understanding of all the available tools that technology partners might have," Ferranti says. "You want to bring those things together and work collaboratively on projects where you're taking the best skills from both sides and creating something that neither one of you can create alone. That's the real potential of partnerships."

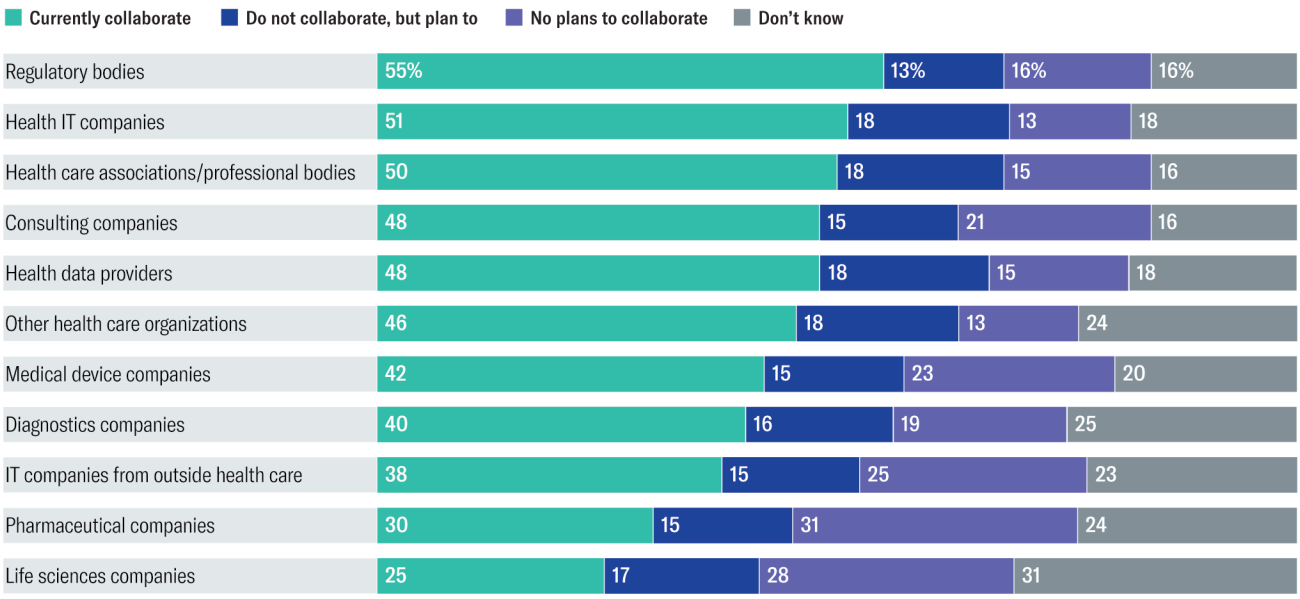
Health care organizations are partnering with a number of external entities in similar capacities. The top entities cited by respondents include regulatory bodies (55%), health IT companies (51%), health care associations/professional bodies (50%), consulting companies (48%), and health data providers (48%). Leaders are more likely to collaborate with external entities overall and particularly with regulatory bodies (63%), health data providers (63%), and other health care organizations (58%), compared with followers (56%, 52%, and 46%, respectively) and laggards (50%, 34%, and 38%, respectively). **FIGURE 4**

FIGURE 4

Collaboration with External Entities

Organizations are partnering most with regulatory bodies and health IT companies

Which, if any, of the following external entities does your company collaborate and coordinate with to facilitate data-driven health management?

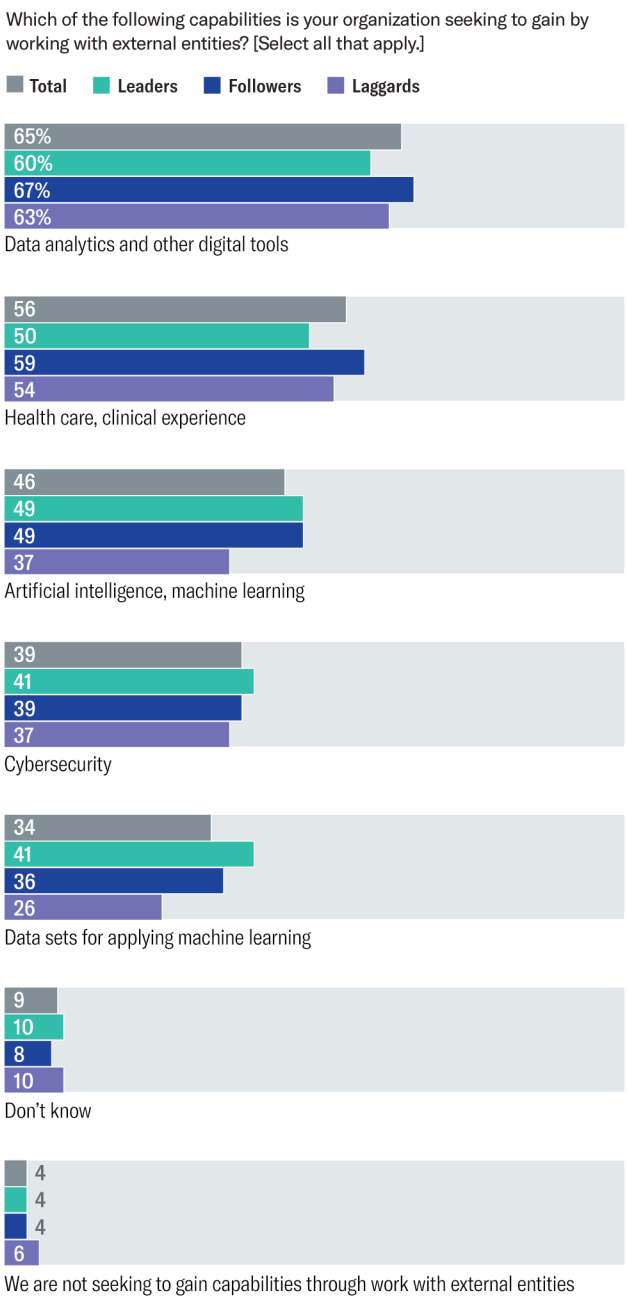


Source: Harvard Business Review Analytic Services survey, January 2023

FIGURE 5

Partnering with External Entities

Organizations are actively seeking data analytics and other digital technology partnerships with external entities



Not shown: Other; 1% Total, 0% Leaders, 2% Followers, 0% Laggards

Source: Harvard Business Review Analytic Services survey, January 2023

The capabilities that organizations are seeking to gain by working with external entities reflect current and cutting-edge data priorities. These top capabilities include data analytics and other digital tools (65%), health care, clinical experiences (56%), artificial intelligence, machine learning (46%), cybersecurity (39%), and data sets for applying machine learning (34%). Leaders and followers, however, are more likely than laggards to be seeking to gain capabilities in two areas: artificial intelligence and machine learning (both 49% vs. 37%) and data sets for applying machine learning (41% and 36% vs. 26%). **FIGURE 5**

While partnerships with external entities can be valuable, they can also introduce challenges. With digital health care startups in particular, more than half (55%) of respondents agree that the growing number of these organizations has made data integration more challenging.

"One of the challenges in creating novel data sources is that it creates more silos," Halamka says. "You have to figure out where you are going to put this data that comes from the startup if it is a data type not typically recorded in an electronic health record or other generally operational, administrative, or clinical system."

Another challenge organizations face with digital health care startups is a lack of security maturity. "A lot of startup organizations have high energy and agility, but don't necessarily have competency in regulatory and sub-regulatory guidance or compliance," he says. "Do they really understand what [the Health Insurance Portability and Accountability Act (HIPAA)] or the general data protection rules in Europe require?"

While they do present challenges, digital health care startups are bringing innovative solutions to health care, 74% of respondents agree. Hospital Sírio-Libanês in São Paulo, Brazil, for example, frequently holds meetings with startups to vet new tools and capabilities, with varying outcomes.

One of those capabilities was an AI solution designed to identify pneumonia and pleural effusion—the buildup of fluid between the layers of tissue that line the lungs and chest cavity—on X-rays. Offered as a single solution, however, it was more expensive and didn't suit the hospital's budget requirements or needs. "In the future, I believe some of these small, very good ideas will move to big companies, where they'll be put together and offered as a digital solution for the entire journey, not just a part of the journey," Nomura says.

Bradley says that these cutting-edge single solutions are a sweet spot for digital health care startups today and can provide differentiating value to organizations looking to strike on something new.

"If digital health startups are focusing on some of the newest areas that health care is venturing into, like acute care settings at home or patient-facing technologies and services, I think they're filling the niche of what the community is expecting,"

he says. "Some organizations have a harder time reacting to quick needs like that. So as most niche vendors have over time, they'll fill in the gaps from the time the need shows up until the big guys can actually start addressing it."

Enduring Data Privacy and Security Considerations

While partnerships with external entities can help solve some of today's most pressing patient health and operational efficiency challenges, organizations also recognize that these data and technology solutions can bring privacy and security risks to health care. Seventy percent of respondents agree that data-driven health care creates new risks for patient data privacy and security, while 66% agree that integrating hospital/lab operations creates new risks for the privacy and security of institutional data. **FIGURE 6**

The challenge for health care organizations is ensuring the data is used ethically, with the most respect for patient privacy, Ferranti says. "At academic medical centers in particular, we are working to enable academic freedom and inspire new discoveries while simultaneously protecting patient privacy and operating with the highest ethics," he says. "That's what we're all trying to solve for."

In the U.S. and Europe, health care organizations are beholden to HIPAA and the General Data Protection Regulation, respectively—two regulations that focus on protecting the privacy and security of personal health information in health care organizations.

Health care organizations expect their technology partners to address these concerns. Among respondents who use cloud-based services to manage clinical applications and health data for individuals and/or population groups, data security and privacy (54%) is the characteristic they consider most important when choosing cloud-based services, followed by ease of integration with existing systems (40%), service reliability (36%), and cost of service (35%). **FIGURE 7**

More organizations appear to be finding the security affirmation they seek, as cloud-based health care data management services have become much more widely used over the past four years. Forty-one percent say their organization is using cloud-based services to manage clinical applications for individual and population health in 2023, compared with 27% in 2019.

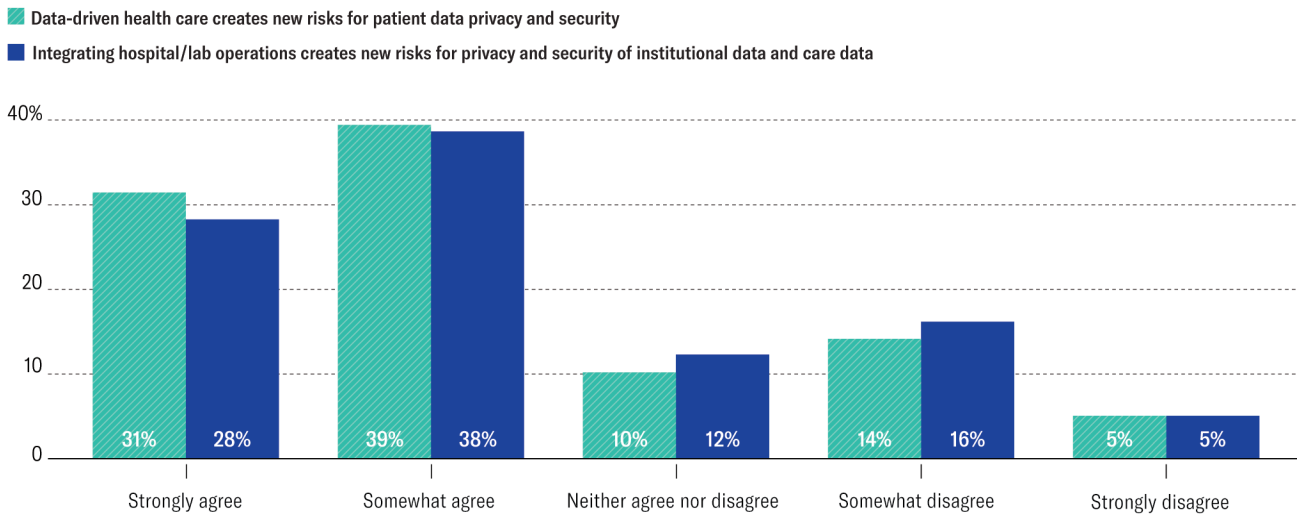
While data privacy and security remain a top consideration for many health care organizations, that's not the case for all. In India, for example, there is no regulation for health care data, says the Indian Institute of Technology's Prasad. "A typical

FIGURE 6

Data Privacy and Security Risks Remain

Data-driven health care and data integrations create new risks for privacy and security

To what extent do you agree or disagree with the following statements?



Not shown: Don't know; 1% both statements

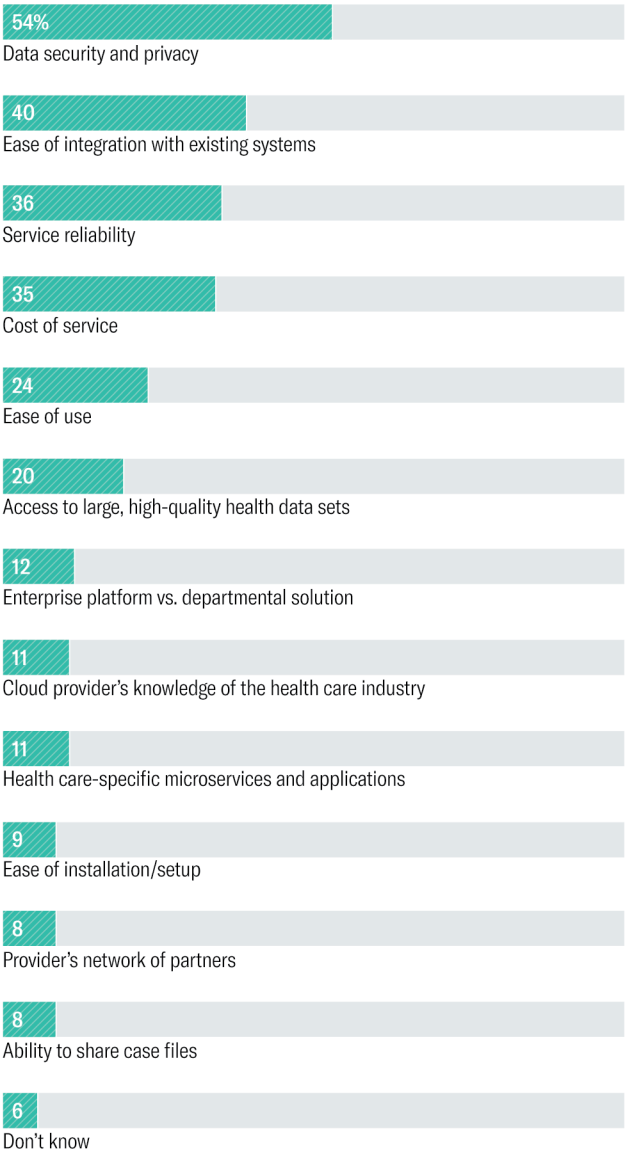
Source: Harvard Business Review Analytic Services survey, January 2023

FIGURE 7

Important Cloud-Based Characteristics

Data security and privacy are the top characteristics organizations seek in their choice of cloud-based services

Which of the following characteristics are most important in your choice of cloud-based services? [Select up to three.]



Not shown: 1% Other

Base: Respondents who use any cloud-based services to manage clinical applications and health data for individuals and/ or population groups

Source: Harvard Business Review Analytic Services survey, January 2023

health care organization in India will invest in priorities that will increase their revenue, and cybersecurity doesn't do that," Prasad says. "It is viewed as an expense."

Data privacy and security are similarly nebulous at Penda Health in Kenya. While the organization follows the Data Privacy and Protection Act, which was assented to by former Kenyan president Uhuru Kenyatta in 2019, Korom says the oversight of data security still isn't very strong. "While we are guided by the Data Privacy and Protection Act, the area is evolving so rapidly that we also need to use our judgment on how best to protect patient data and privacy," he says.

Conclusion

Health care organizations are turning to data to solve some of the most pressing challenges in patient health and operational efficiency. And while many have made strides in becoming more data driven over the past four years, fewer organizations have reached maturity in this area.

To achieve maturity, health care organizations must work to improve data integration and interoperability. Data tools and partnerships will be key to connecting incompatible and disconnected systems and introducing new data sources, thereby enabling richer analytical insights and unlocking innovative solutions to improve patient health and operational efficiency.

Organizations must also address cultural challenges by increasing collaborative efforts, upskilling data users, and continuing to lobby for the necessary funding to support integral and cutting-edge data efforts. At the heart of these efforts is a strong chief medical officer, Bradley says. "They're the ones championing the value and importance of data. They're the ones having these conversations, and they're the ones driving these efforts forward," he says.

As health care organizations progress toward becoming more data driven, partnerships with external organizations, particularly for data analytics and other digital technologies, will become more critical. While these partnerships present opportunities for collaboration, they may also introduce data integration challenges, which will need to be managed. Lastly, as digital transformations progress, privacy and security must remain top of mind, particularly as more organizations adopt cloud-based data solutions.

The future of health care is data driven nonetheless, Halamka says, and organizations that harness these new capabilities and address these challenges have promising futures. "By 2030, health care organizations will be data businesses. Their jobs will be to collect and interpret data from all kinds of locations, from the patient's home to the devices they wear, and they'll be integrating and interpreting all of the data around a patient's lifetime journey," he says. "But you can't do this alone. You need an urgency to change, a guiding coalition, and you need a senior vision. That's what will take us into the future."

METHODOLOGY AND PARTICIPANT PROFILE

Harvard Business Review Analytic Services surveyed 757 members of the *Harvard Business Review* audience via an online survey fielded in January 2023. Respondents qualified to complete the survey if they work in the health care industry or in a health care–related industry and are familiar with their organization's use of health data and digital technologies for research, diagnosis, and/or treatment decisions.

Size of Organization

31% 10,000 or more employees

27% 1,000–9,999 employees

20% 100–999 employees

22% Fewer than 100 employees

Seniority

37% Executive management/ board members

29% Senior management

15% Middle management

19% Other grades

Industry Sectors

30% Hospital/practice

14% Consulting

10% Integrated health care delivery system

9% Academic/ research/ medical training

All other sectors less than 9% each.

Job Functions

16% Professional (health care/legal)

13% General management

13% Admin

11% Consulting

All other functions less than 9% each.

Regions

63% North America

17% Europe

10% Asia Pacific

6% Latin America

4% Middle East/Africa

Figures may not add up to 100% due to rounding.

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