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The intersection of digital health and equity



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About this report

The Intersection of Digital Health and Equity is a report by Economist Impact that identifies the bidirectional nature of digital health and its impact on equity within health systems. Taking into account the breadth and depth of considerations around digital health and health equity across the US and beyond, we sought to develop a framework to drive greater understanding and action around this issue. Through this framework, this report analyzes the relationship between each domain of digital health and each pillar of an equitable health system, offering insights by leading experts and presenting recommendations to drive improvements.

We extend our sincere appreciation to the following interviewees for their time and contributions to this work:

- **Craig Ahrens**, founder, Center for Health Workforce Innovation and Technology
- **Eskinder Negash**, president and chief executive officer, US Committee for Refugees and Immigrants
- **Megan Coder**, chief policy officer, Digital Therapeutics Alliance
- **Omar Costilla-Reyes**, research scientist, Computer Science and Artificial Intelligence Laboratory at the Massachusetts Institute of Technology; president and founder of AI Latin American SumMIT
- **Yisela Alvarez Trentini**, UX/UI designer, HCI consultant and anthropologist

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Executive summary

As technology advances rapidly, health systems are finding new and innovative ways to deploy digital solutions to address health challenges. The integration of digital health has demonstrated benefits in terms of population health and improved efficiency in the delivery of care; however, in some cases, it has also exposed and exacerbated various inequities that have long existed in health systems and wider society. Adverse health outcomes have disproportionately impacted at-risk populations as a result of health inequities. Digital health can play an important role in addressing these inequities.¹

This research primarily aims to define the implications, gaps and opportunities at the intersection of digital health and health equity as a critical component of progress toward effective, high-value care for all. The analysis is underpinned by four core pillars of digital health equity:

Pillar 1: Empowerment and access

There are four types of access restrictions impacting medically underserved populations: physical, financial, sociocultural (linguistic and immigration-related) and digital. Studies report lower access rates to digital devices and

infrastructure, financial challenges in purchasing digital devices and utilizing digital health services, inability to understand information due to language barriers and limited digital literacy skills, and access gaps in medical coverage and assistance among underserved populations. Empowerment and engagement is critical to counteract these barriers.

Pillar 2: Accountability and justice

Racial and gender disparities within the health system limit access to care and remove the opportunity for better health outcomes. This presents serious ethical issues, impacting fairness and justice. Social justice in digital health represents an individual's opportunity to equitably use digital health to obtain the highest levels of health and wellbeing. To ensure that digital health equity is attainable, health systems need to be accountable for the care that they provide. In addition, guidelines and policies must reflect the population's needs and ensure that stakeholders are held accountable to the highest standards, which begins with understanding the population being served.

Pillar 3: Community and leadership

Various technologies can have critical limitations owing to design problems, as well as being informed by insufficient and low-quality datasets. These challenges can lead to medically unsound recommendations and even, at times, harm. Leadership diversity and community engagement are critical components of improving the design of digital health technologies equitably. Improving the ease of accessibility and usability can help to increase engagement and build trust among at-risk users.

Pillar 4: Metrics

Currently, there are gaps in the production, collection and sharing of data within the digital health environment. Researchers identify various reasons, including digital system fragmentation, low levels of user engagement, and the segmentation and siloing of health data, among others. In addition, security and privacy concerns have limited trust and reduced utilization of digital health technologies by underserved populations. In parallel, they have increased a lack of trust in the system, building on past injustices. Although promising encryption technologies are in the market, these challenges will also require updating policies to protect user data and hold the technology industry accountable to new standards.

The future of digital health equity

Although more attention is being paid to creating a more equitable health system, much work still needs to be done. In particular, the inclusion of diverse stakeholders is critical to addressing shortcomings of digital health equity, and these stakeholders must be willing to work closely with communities to develop and implement equitable solutions. Our analysis of the intersection of digital health and health equity revealed four actionable findings:

RECOMMENDATIONS: FROM LESSONS TO ACTION

1. Since digital health equity is part of a much larger, complex, multi-sectoral and multi-level digital ecosystem, it is important to understand its direct and indirect impacts on the different domains of health. Further research is necessary to quantify the direct impacts of improvements in digital health equity on each social determinant of health.
2. Inclusion is required for any successful impact in improving digital health equity. It is inefficient and ineffective to offer solutions without including those most impacted in decision-making. It is essential to increase the diverse representation of underserved populations in positions of decision-making, ranging from healthcare executives to community health leaders.
3. User and community-centered engagement are essential to understand population needs and develop effective and actionable strategies. Inclusion of underserved groups and respective community leaders in the technology design phase is critical to increasing engagement. This should be the industry standard.
4. Current policies, standards and guidelines need to be updated to ensure that actions are taken to improve infrastructure and access, protect medically underserved populations, and enforce greater accountability. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) needs to be revisited and policymakers should consider supporting legislation that focuses on expanding access and enhancing protections for underserved populations, such as the Digital Equity Act of 2021.

The current state of digital health equity

The role of digital health is rapidly expanding in healthcare. Even before the covid-19 pandemic, many healthcare systems and providers embraced digital health to lower costs, improve healthcare access and increase efficiency. As technology expands further into all sectors of health (Figure 1), many stakeholders are learning to integrate digital solutions aimed at improving efficiency and data accuracy as well.²

Although there are clear positive impacts of the digitalization of the health sector, technology has also risked exacerbating inequities that are inherent to the healthcare system.^{3,4} These inequities span multiple areas, including—but not limited to—socioeconomic status, age, race, culture, language, technological literacy and location (rural/urban). As an example, the explosion of virtual health visits (telehealth) increased access during the covid-19 pandemic for many who were unable and unwilling to attend in-person medical visits.⁵ On the other hand, patients that live in areas with poor internet connectivity, who do not own a computer, are not technologically literate or face other barriers could not benefit from the new technology and were left further behind. Some patients also simply prefer in-person visits to digital ones.

A 2020 study commissioned by the Consumer Technology Association and conducted by Economist Impact reported that the vast majority of health administrators, payers, policymakers and regulators believe that technology has positive impacts on the health system, from improving satisfaction to driving quality of care.¹

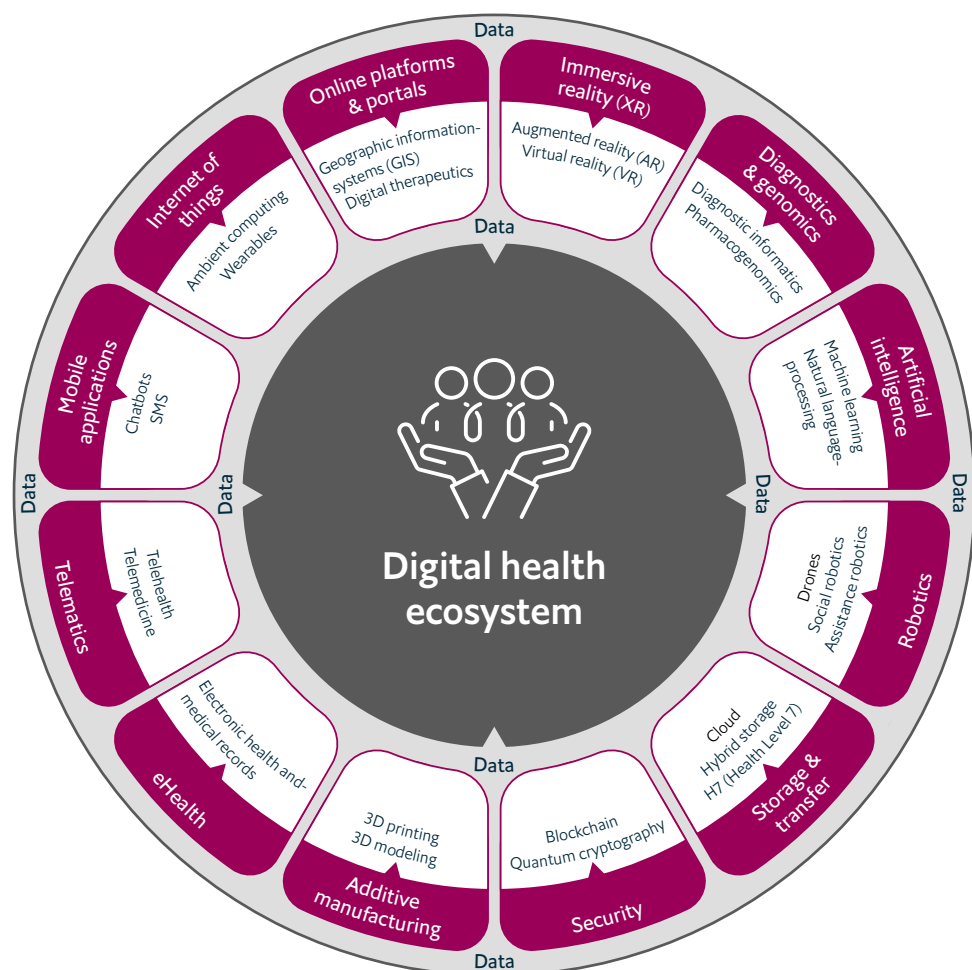
This report explores the relationship between digital technology and health equity, identifies their intersections, evaluates how technology can add value and bring challenges, and offers evidence-based recommendations on how to ensure that digital health solutions can improve equitable care, and vice versa. The digital health revolution brings healthcare to an interesting crossroads. How we consider inequities in digital health will go a long way in determining if digital health can be an improvement to the existing system or not.

To define the current state of digital health and digital health equity we must first define both terms. According to the US Food and Drug Administration (FDA), “the broad scope of digital health includes categories such as mobile health (mHealth), health information technology (IT), wearable devices, telehealth and telemedicine, and personalized medicine.”⁶

This is only one definition, but it covers a great deal of the digital devices and technologies that are used within healthcare. Another definition, which takes it a step further, comes from Crawford and Serhal, who define “digital health” as “the field of knowledge and practice associated with the development and use of digital technologies to improve health across the full range of health technologies introduced into care, including telehealth, mobile health apps and wearable technologies, and online health services and tools.”⁷

“Digital health equity” can be difficult to define, but in this case, we are talking about equitable opportunity. A clear definition of “digital health equity” comes from a study published in *BMC Health Services Research*: “An equal opportunity for individuals to benefit from the knowledge and practices related to the development and use of digital technologies to improve health.”⁸ With these definitions in mind, we explore the current state of digital health equity more deeply from a population perspective.

Figure 1: Digital health ecosystem



Digital health inequity: a population perspective

Digital health inequity can be found throughout healthcare systems, particularly in the US. Although not exhaustive, we examine the nature of the current state of digital health equity through the lens of the following populations: immigrants and refugees, LGBTQIA+, African Americans, Native Americans/Alaskan Natives, Asian Americans, and Latinos and Hispanics.

Immigrants and refugees

Immigrants and refugees in the US suffer from health disparities in general, and digital health is no exception. This is especially true for undocumented immigrants, as their undocumented status discourages them from seeking medical care, except in case of emergencies. Undocumented immigrants also tend to experience higher rates of poverty and harsher working conditions, all of which contribute to a lack of adequate medical care.⁹

When it comes to digital health equity, the above-mentioned issues come into stark relief. Refugees and undocumented immigrants come from a rich variety of cultures and backgrounds, but digital health smartphone applications and other devices are typically designed for English speakers. Smartphone ownership among immigrants is close to 90%. However, if phone applications are not designed in the native language of immigrants or with their needs in mind, these apps are less likely to be effective or utilized.¹⁰ Better command of the English language has been associated with higher odds of having used digital services among naturalized citizens and noncitizens, which is consistent with research on the use of healthcare in general.¹¹

LGBTQIA+ people

The LGBTQIA+ community faces issues that are somewhat like those faced by other groups. This population group is incredibly diverse, but in one study, digital health interventions were generally found to be acceptable to LGBTQIA+ young people, and there were some clear themes in aspects of these interventions that determined users' level of interest.¹² However, this increased interest and acceptability does not mean that many mobile applications, devices or other digital health interventions are specifically designed with the needs of this population. In fact, acceptability among those in the study in question appeared to be closely linked to collaborative intervention design development with LGBTQIA+ young people and the digital modality of delivery, even though many of these tools are not developed in a collaborative manner.¹²





Racial and ethnic groups

African Americans are another incredibly diverse group that often suffers from digital health inequity. However, there are a wide range of digital products designed for the African American community. There are also many digital products that are designed by African American researchers, which generally helps to improve effectiveness and uptake for the relevant population.¹³ Yet, with often higher rates of poverty than the US population as a whole, and with some of this poverty occurring in rural areas, computers and broadband access are still inadequate to fulfill all that digital health can offer.

Importantly, Native Americans are the only minority group with a higher rural than urban share of the population.¹⁴ This means that they are uniquely susceptible to the rural/urban digital divide. In addition, the Native American and Alaskan Native populations tend to live in areas with lower rates of medical coverage and higher rates of poverty. The Indian Health Service (where many from this population receive their medical care) does not have a nationally coordinated telemedicine program. The availability of specific solutions like digital health tools varies from location to location, depending on population characteristics and the

availability of specialty services.¹⁵ It is important to note that culturally tailored and user-centered interventions are critically needed to increase the degree to which health messages are perceived as relevant by the youth of these populations, thus inspiring and supporting behavior change.¹⁶











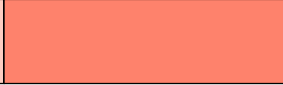
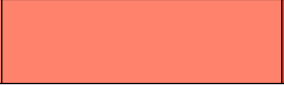

In contrast to Native Americans and Native Alaskans, Asian Americans live predominantly in urban areas, meaning that the challenges for this population are different from a digital health perspective.¹⁴ In many cases, the data on race and ethnicity included in digital health studies often exclude Asian Americans or does not identify Asian American subgroups.¹⁷ In terms of digital health equity, Asian Americans are often forgotten or lack adequate tools designed specifically for their needs.


Latino and Hispanic people are the fastest growing segments of the rural population, although they make up just 9% of the rural population currently, compared with 20% of urban areas.¹⁴ This group is also incredibly diverse within itself, originating from many different cultures and languages. From a digital health equity perspective, many digital tools are designed in Spanish, but other less-common languages for this group are lacking.

Framework: The Intersection of Digital Health & Equity

Taking into account the breadth and depth of considerations around digital health across the US and beyond, we sought to develop a framework to drive greater understanding and action around this issue.

Figure 2: Digital health equity framework

Digital health equity framework 	Domain 1 Sociocultural • Digital literacy • Cultural perspectives • Acceptance & engagement • Ownership	Domain 2 Technical • Technology development (UX/UI) • Interoperability & scalability • Data production & collection	Domain 3 Governance & Policy • Policies • Infrastructure & workforce • Security
Pillar 1 Empowerment & access			
Pillar 2 Accountability & justice			
Pillar 3 Community & leadership			
Pillar 4 Metrics			

 = Interaction between a Pillar and a Domain that is examined within this report

 = Interaction between a Pillar and a Domain

Pillar 1: Empowerment and access

As healthcare systems championed the rapid expansion and use of digital health technologies during the covid-19 pandemic, interventions targeting underserved populations were often overlooked.^{18, 19} Inequities have been deeply rooted in healthcare for a long time, and the pandemic has exposed severe challenges in treatment effectiveness and health outcomes for underserved patients. Access is one such challenge.²⁰⁻²²

Four types of access restrictions have negatively impacted health equity over the years. The first well-known barrier to access is physical. Despite an increase in technology ownership and improvements in telecommunications infrastructure, rates of access to broadband services and ownership of digital devices remain low among underserved populations.²³⁻²⁶

Despite an increase in technology ownership and improvements in telecommunications infrastructure, rates of access to broadband services and ownership of digital devices remain low among underserved populations.

Table 1: Types of access challenges

- 1) Physical access
- 2) Financial access
- 3) Linguistic and immigration access
- 4) Digital access

This is most often the case among rural, low-income, racial and ethnic minority groups, including individuals over 65 years of age.²³ In addition, there is a significant gap in access among households where at least one member has a disability.²³ Improving physical access to care empowers underserved communities to engage in digital health services, going one step closer to closing the gap in the digital divide.

Financial access is also a central challenge. A study conducted by the US Department of Health and Human Services (HHS) reported that, despite a 7% improvement in access to the internet by Americans in poverty, low-income populations in the Southeast and Midwest regions of the US lag behind in overall access.²⁷ The Pew Research Center reported that

Americans with lower incomes tend to have a lower percentage of technology adoption, despite a higher dependence on smartphones.²⁸ It is crucial to keep in mind that despite having the financial ability to purchase a mobile phone or computer, there is another dimension of financial accessibility: insurance and reimbursement. Not all digital health technologies are covered and reimbursed in health insurance plans and Medicare/Medicaid, and financial access may require the restructure of payment structures in the US.^{29,30} “The reimbursement structures are set up in a way that encourages me to see you in person to make more money, so the whole system of care needs to be redesigned,” says Craig Ahrens, chief strategy and partnerships officer at CareRev. The first example of this obstacle can be found in digital therapeutics.

“The idea that you could start to actually have an accessible type of a therapy that’s scalable to anyone in any location, jurisdiction or region, for whatever disease state they [have], regardless of whatever access they’ve been denied in the past, it’s pretty incredible when you think about it.”

Megan Coder, chief policy officer, Digital Therapeutics Alliance.

Digital therapeutics are “evidence-based therapeutic interventions driven by high-quality software programs to prevent, manage or treat a medical disorder or disease.”³¹ If paired with remote monitoring and virtual visits, digital therapeutics can offer a full-stack digital health continuum.³² “The idea that you could start to actually have an accessible type of a therapy that’s scalable to anyone in any location,

jurisdiction or region, for whatever disease state they [have], regardless of whatever access they’ve been denied in the past, it’s pretty incredible when you think about it,” says Megan Coder, chief policy officer of the Digital Therapeutics Alliance.

Digital therapeutics are still early in their adoption, and as a result, access is a critical issue. “How do you actually scale, implement and give broader access? I think this is an issue that our industry is looking at,” says Mrs Coder. “One of my primary concerns right now is not only delivering products to entire populations, but the lack of payor recognition of this product category and, therefore, an inability to provide access.” The digital therapeutics promises to offer patients effective treatment in one of the most efficient mediums—digital technology.^{33,34}

One challenge in the rapid adoption of digital therapeutics is financial accessibility through insurance or Medicaid/Medicare.³⁵ The Access to Prescription Digital Therapeutics Act of 2022, which was introduced in the US Senate in March 2022, includes a proposal for Medicare/Medicaid to provide coverage, expand access and establish a payment methodology for manufacturers.^{36,37} If this legislation is passed, further research is needed to quantify its impacts on financial accessibility for underserved populations.

Telehealth is another effective digital health technology whose coverage and reimbursement mechanisms may impact financial accessibility. Data show a rapid increase in telehealth use during the covid-19 pandemic in the US—a 38-fold increase compared with pre-pandemic reports.³² In parallel, there was an increase in the range of telehealth services offered; 84% of doctors offered telemedicine services during the pandemic.³² However, the increase in use was not directly correlated with improvements in equity.³⁸ Research reported that Asian American patients had a lower probability of using telehealth

services, as also occurred with uninsured patients and those covered by Medicaid.³⁹ A national survey conducted by the HHS Office of Health Policy concluded that the uninsured population had the lowest telehealth utilization.⁴⁰

A third critical challenge of access derives from sociocultural and legal factors—in particular, linguistic and immigration barriers. “Technology is only as good as the people that use it in the context of using it well, and written in a language that people can understand,” says Mr Ahrens. “You need to mold it for the populations you take care of.”

Not every digital technology interface offers translation services for non-English speaking patients. This is where organizations such as the US Committee for Refugees and Immigrants (USCRI) step in to help patients understand health information. “Language and cultural barriers always play a role,” says Eskinder Negash, president and chief executive officer of the USCRI, “So a lot of agencies, including ours, tries to put some information in different languages so at least [immigrants and refugees] have some understanding. But I believe, as we go forward, telemedicine needs to really focus on multilingual, multicultural information that’s available 24/7.”

Telemedicine is not the only technology that must consider offering multilingual interface and interpreter services. “If I am dispensing a digital therapeutic, the notion that if my patient is Spanish-speaking only, and this detox product is not in Spanish, then I know it’s going to have no value because that interface is not there,” says Mr Negash, who believes that a

further step is required—the UX/UI process should consider these challenges. “At that core level, it’s not as simple as just saying ‘I will just translate [the digital intervention] to a new language’—it has to meet the patients where they’re at. Having those human factors, having the UX/UI process and all these other ideas behind it is really core to a digital therapeutic, which is slightly different possibly than some other therapeutic modalities that have previously existed.” If digital health technologies are not developed considering non-English speakers in the US, then healthcare systems are excluding a massive population group.

Table 2: Linguistic and immigration barriers⁴¹⁻⁴⁴

Language	
People in the US who speak a language other than English at home	66m
People in the US who speak English less than very well	25m
Immigration status	
Not a US Citizen	21m
Refugee*	11,000
Undocumented**	11m
Deferred Action for childhood Arrivals (DACA)**	800,000

* Refugees admitted during the 2020 fiscal year (October 1st 2019 - September 30th 2020)

** Numbers are projected by different organizations and may vary, as data are not openly reported.

The level of physical and financial access to healthcare depends significantly on a patient's immigration status.^{45,46} According to the HHS, "undocumented immigrants aren't eligible to buy Marketplace health coverage, or for premium tax credits and other savings on Marketplace plans."⁴⁷ The health impacts among undocumented immigrants are significant—depression, post-traumatic stress disorder, and denial of prenatal care and HIV prevention are a few.^{48,49}

Not only do these challenges impact population health, they also lead to ethical, legal and administrative conflicts by healthcare institutions.⁵⁰ "State and the federal government can't just simply dismiss millions of people in this country because they don't have an immigration status ... that actually doesn't mean that they no longer need care," says Mr Negash. "[We need a] healthcare system that's inclusive. That takes all of us [to provide] the same kind of treatment."

Clear health disparities will continue to impact undocumented people and those protected under the Deferred Action for Childhood Arrivals (DACA) program.⁵¹⁻⁵³ Eligibility restrictions remove access to health insurance, reimbursement, and government funds and subsidies. This limits people's ability to afford various digital technologies, such as telemedicine consultations and digital therapeutics.

Mr Negash asserts that community-based immigrant stakeholders must focus on helping, at minimum, to provide health information in multiple languages. "That information is going to impact [the refugee and immigrant community]," he says. "Community-based organizations or community-based health providers need to focus on [patient health] education." Research affirms that health literacy and the ability to understand health information is a significant issue of access of digital health tools.⁵⁴⁻⁵⁶



Digital access: the relationship between digital literacy and access

Digital health literacy, or eHealth literacy, can be defined as “the ability of people to use emerging information and communications technologies to improve or enable health and healthcare.”⁵⁷ This includes the ability to access mobile applications and the internet, among other digital health technologies.⁵⁸ Digital literacy has a spill-over effect into other parts of the digital ecosystem. Improvements in digital literacy can lead to a decrease in the digital divide, better access to public services, advancements in workforce skill development and an increase in people accessing digital health information.⁵⁹ Consequently, improvements in equitable access to services and information depend on the level of digital health literacy. Obtaining higher levels of digital health literacy is one of the critical steps in progressing towards equitable access and social justice.⁶⁰

WHAT IS THE DIGITAL DIVIDE?

The OECD defines the digital divide as “the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard to both their opportunities to access information and communication technologies (ICTs) and to their use of the internet for a wide variety of activities.”¹³⁷



Digital health literacy tends to be lower among certain minority groups, specifically older people, less-educated populations, African Americans and Latino or Hispanic people.⁶¹ For example, the covid-19 pandemic has shown that patients who have low levels of digital health literacy are often unable to seek risk prevention, fully adhere and comply with online health guidelines, or obtain vital health information such as testing information.⁶² The multidimensional impact caused by levels of digital health literacy on population health has led researchers to consider it a “super determinant of health.”^{63,64}

Patient portals, for example, offer individuals the opportunity to take ownership of their health, consequently leading to various positive health outcomes such as improvements in preventative care, adherence to medication and self-efficacy, among others.⁶⁵ Patients can benefit as long as they are able to navigate the portal interface and understand the information presented to them; however, this ability depends on their level of digital literacy. While 90% of the US healthcare systems offer access to online electronic medical records through patient portals, less than one-third of patients access online portals.⁶⁶ A study conducted by the Office of the National Coordinator for Health Information Technology reported that low rates of online portal access stem from difficulties in using computers and logging in to online portals.⁶⁷ Separately, a systematic review investigated patient engagement on online patient portals and concluded substantial impacts of digital literacy on access.⁶⁶ Improving digital health literacy will lead to improvements in online patient portal engagement, but it will also improve equitable access and utilization of other digital health technologies.

To achieve such goals, stakeholders must engage at different levels and collaborate across multiple sectors. At the community level, the government should expand digital literacy programs in public libraries, schools and local venues by reinstating the Community Technology Centers program and creating other industry-based partnerships.^{39,59,68,69} A community-level approach would help to target population groups with lower levels of digital literacy by building trust and establishing a strong community foundation in healthcare engagement.^{70,71} In addition, providers should also obtain relevant digital health literacy sensitivity training to assist patients in navigating the digital health ecosystem, as well as offering tailored digital health information based on their patient's level of digital health literacy.⁶² Overall, a community-led solution to improving digital literacy and increasing engagement in digital health will need multi-stakeholder collaboration is from city, state and federal governments, as well as the technology industry and local venues.

In addition, considering the barriers to access to digital health services, multisector and multilevel stakeholder collaboration is critical to improving current inequities in access. The US government needs to provide and extend Medicare/Medicaid coverage to effective modalities of digital care, incentivize providers through new payment models to utilize telehealth, and expand reimbursement and subsidies for low-income populations.^{39,68,72,73} Making telehealth more affordable is an important step in expanding access. State and federal governments should consider providing the necessary infrastructure, stimulate collaboration and align policies and guidelines to increase equitable access.

Technology developers can also play a critical role in expanding access. Developers should ensure that digital technologies are compatible with all devices, offer translation extensions and plugins

for digital health information and services, as well as offer multilingual and multimodal support considering different levels of digital literacy.⁸

Policymakers and decision-makers should also consider the merits of expanding coverage to at-risk populations regardless of immigration status that are not currently covered by policies. It is important to note that other pillars in this study also directly impact access, such as the level of acceptance, trust, security and cultural awareness. Expanding access will empower individuals to engage in the healthcare system and take ownership of their health.

KEY TAKEAWAYS

1. Improving physical access to care empowers underserved communities to engage in digital health services, going one step closer to closing the gap in the digital divide.
2. If non-English speakers are not considered by those developing digital health technologies in the US, healthcare systems are excluding a massive population group.
3. Digital literacy has a spill-over effect into other parts of the digital ecosystem, impacting the digital divide, access to public services, workforce skill development and access to digital health information.
4. Developers should ensure that digital technologies are compatible with all devices, offer translation extensions and plugins for digital health information and services, and offer multilingual and multimodal support that considers different levels of digital literacy.

Pillar 2: Accountability and justice



Lessons from the covid-19 pandemic brought to light ethical issues of racial disparities in treatment efficacy and access to care, misinformation about life-saving medical interventions, and the right of individuals to data privacy and security.^{74,75} Decision-makers and clinicians have a moral obligation to pursue a more just and equitable system that offers quality care without bias or discrimination. Ethics in healthcare presents an interesting position on justice and the moral obligation of the healthcare system in its relationship with individuals. “Justice describes the social obligations to promote and restore health as a means to achieve individual opportunities and exercise individual autonomy,” as one report puts it.⁷⁶ Specifically within the digital health equity landscape, one study defines digital health social justice as “the equitable opportunity for everyone to access, use and benefit from digital health to achieve their greatest standard of health and wellbeing.”⁷⁷

Improving respect through sociocultural and linguistic awareness

The first step towards justice and equity is understanding the populations that health systems are serving. “There are still problems in healthcare [where] we need to really understand the human being behind these problems, because everyone is different, developing digital precision medicine is very important to aim to solve these problems” says Omar Costilla-Reyes, a research scientist at the Computer Science and Artificial Intelligence Laboratory at Massachusetts Institute of Technology, and the president and founder of AI Latin American SumMIT. Without this knowledge, healthcare systems are unable to ensure that underserved populations have access to equitable and high-quality care.⁷⁸ Digital health can serve as a tool in removing geographical barriers, but real racial inequities are still prominent in technologies like telehealth.⁷⁹

“There are still problems in healthcare [where] we need to really understand the human being behind these problems, because everyone is different, developing digital precision medicine is very important to aim to solve these problems.”

Omar Costilla-Reyes, research scientist, Computer Science and Artificial Intelligence Laboratory at the Massachusetts Institute of Technology; president and founder of AI Latin American SumMIT.

Increasing sensitivity to cultural perspectives and behaviors is a step toward inclusion in digital health development to create a more just and equitable digital health ecosystem. Research advocates for sociocultural awareness and cultural sensitivity training among the healthcare workforce, as it brings several social and health benefits.⁸⁰ One study proposed a link between the level of cultural and linguistic

competency of physicians and the increase in patient satisfaction, treatment adherence and information seeking and sharing, leading to a formation of trust rather than stigmatization.⁸¹ However, physicians can be unaware of how communication and implicit bias may impact the quality of care, patient engagement and equitable outcomes.⁸² This can further exclude underserved patients.

“Refugees and immigrants struggle in navigating the healthcare system—it’s not user friendly,” says Mr Negash. “There is a ... language barrier for some patients, depending who their providers are, but it is [also] a very complex system.” It is imperative for medical personnel, from doctors to medical schedulers, to understand the socio-cultural and linguistic challenges that underserved populations encounter throughout the care continuum and receive training on how to reduce these barriers.⁸¹ For this to be possible, healthcare systems first must have equity as a long-term priority, and as they consider equity gaps within their organizations, equity in digital health interventions should be at the forefront of actionable strategy.⁸³ “Not only does digital therapeutics have to be an engaging product and actually deliver its clinical therapy, it has to have the language [accessibility] that the patient is using and some of the cultural references that they have,” says Mrs Coder. Linguistic and cultural awareness should lead to improvements in offering digital healthcare and more culturally sensitive medical interventions and programs.

Secondly, healthcare systems should collaborate with the communities that they serve to understand gaps and offer equitable solutions. This should not lead to tokenism; moving toward equity requires moving away from tokenism. Being genuine and transparent is an important element of inclusiveness and diversity because it generates trust.⁸⁴⁻⁸⁸ Partnerships should transparently and actively engage patients and community leaders in discussions to improve



population health, such as creating a community advisory committee.^{75,83,89,90} Partnerships should develop culturally sensitive patient education and training to improve patient understanding and help to develop digital literacy skills, as mentioned in the previous pillar.

Finally, healthcare systems need to understand that providing equitable care goes beyond a virtual consultation—it encompasses holistic care. Thus, sociocultural awareness and understanding are critical for equitable action, and healthcare systems should identify and address sociocultural gaps that lead to inequitable digital health solutions.

Developing and enforcing standards

Policies and guidelines are imperative, as they establish agreed-upon standards—backed up by accountability and enforcement—for the creation of a more equitable healthcare system. Policymakers and regulators are critical in this process. A study commissioned by the Consumer Technology Association and conducted by The Economist Intelligence Unit in 2020 surveyed

physicians (primary care and specialists), payers (public and private insurers) and administrators (health system administrators and leaders), finding that these stakeholders believe that the most influential actors in determining technology adoption are policymakers, regulators and government.¹ In the US, the Federal Trade Commission (FTC), the HSS and the FDA are regulatory authorities in the formulation of guidelines, standards and enforcement of security and privacy in digital health, albeit each with their unique scope.⁹¹ For example, in 2019 the FDA published a guidance document that contains nonbinding recommendations regarding the organization's regulatory and enforcement scope for software and mobile medical applications.⁹² In the document, the FDA asserts oversight on software on medical devices and some AI-enabled products.⁹³ The same document provides detailed definitions and examples of what is not regulated.⁹² Data protection amid these recommendations is to be in line with the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

New legislation currently being reviewed by Congress will expand on the role of the state and federal government, including its respective agencies (Table 3). These new laws aim to directly or indirectly impact digital health equity. For example, the Digital Equity Act of 2021 aims to expand funding through grant programs that promote health equity and improve digital infrastructure.⁹⁴ States that desire to obtain federal grants through this Act must develop a “State Digital Equity Plan” that includes identifying barriers to digital equity based on the state’s population. Alongside working to advance proposed legislation, policymakers should ensure that the development of new laws incorporate the voice of all stakeholders, especially underserved patients. Laws that encompass digital health equity should also include elements of accountability and enforcement to lead to more equitable outcomes.

KEY TAKEAWAYS

1. Health professionals can be unaware of how communication and implicit bias may impact the quality of care, patient engagement and equitable outcomes, further excluding underserved patients.
2. Community-led partnerships should develop culturally sensitive patient education and training to improve patient understanding and help to develop digital literacy skills.
3. Policymakers should ensure that the development of new laws incorporate the voice of all stakeholders, especially underserved patients.

Table 3: Examples of legislation that could impact digital health equity⁹⁵

Legislation	Sponsor	Latest action	Date of action*
S.3791 - Access to Prescription Digital Therapeutics Act of 2022	Senator Shelley Moore Capito (R-WV)	Introduced: Read twice and referred to the Committee on Finance.	March 2022
S.2018 - Digital Equity Act of 2021	Congresswoman Patty Murray (D-WA)	Introduced: Read twice and referred to the Committee on Commerce, Science and Transportation.	June 2021
H.R.6373 - To establish the Digital Literacy and Equity Commission, and for other purposes	Congresswoman Brenda L Lawrence (D-MI-14)	Introduced: Referred to the House Committee on Energy and Commerce.	January 2022
H.R.4259 - Strengthening Digital Identity Act of 2021	Congressman Bill Foster (D-IL-11)	Introduced: Referred to the House Committee on Science, Space and Technology.	June 2021
S.224 - Promoting Digital Privacy Technologies Act	Senator Catherine Cortez Masto (D-NV)	Read twice and referred to the Committee on Commerce, Science, and Transportation.	June 2021
H.R.366 - Protecting Access to Post-COVID-19 Telehealth Act of 2021	Congressman Mike Thompson (D-CA-5)	Referred to the Subcommittee on Health.	February 2021

* As of June 2022.

Pillar 3: Community and leadership

When doctors input a patient's family history into their electronic health records, or a patient accesses an online portal and participates in a telehealth consultation, they are interacting with a digital interface. Technology developers work to create a user-friendly interface to increase engagement. While human-centered design places individuals at the center of the design process, community-centered design takes into account the social behaviors and needs of a population when developing design solutions.^{96,97} "Digital Precision medicine is really [important] for understanding the patient and who's behind the problem we're trying to solve," says Costilla-Reyes, an expert in digital healthcare.

Studies have reported that user-centered and culturally tailored interventions can lead to greater acceptance of using different digital health modalities. As a result, acceptance is closely linked with collaborative design.

Studies have reported that user-centered and culturally tailored interventions can lead to greater acceptance of using different digital health modalities. As a result, acceptance is closely linked with collaborative design.^{12,16} For example, despite reportedly being four times more likely to have searched online for information about HIV/AIDS and other STIs and nearly twice as likely to search for general health information online, many members of the LGBTQIA+ community encounter mental health challenges and are subject to a higher incidence of HIV.^{12,98} Similarly, minorities and immigrants are highly likely to be smartphone-dependent, yet research indicates a significant lack of digital interventions designed for these groups.¹⁰ Mobile technologies can play a critical role in communicating, educating and providing access to highly mobile population groups.⁹⁹ Human- and community-centered design would open access to previously untapped population groups and improve equitable health outcomes.

Designing for equity

Equitable accessibility is key to reaching underserved populations. “I think one of the most important factors when designing interfaces or experiences for healthcare is to make sure they are accessible and easy to use,” says Yisela Alvarez Trentini, a human-computer interaction and user experience (UX) designer and writer. “For example, they should be available for all kinds of people—people with low vision, people with mobility impairment—and across various devices like computers, smartphones or tablets.” Healthcare UX and user interface (UI) design should consider patients from different socio-cultural, ethnic and linguistic backgrounds, as well as those with different types of disabilities, and gender and sexual orientation. UX processes may unintentionally leave out vulnerable and marginalized potential users from the design and

validation process, leading to a lack of usability that further exacerbates inequities in usability and accessibility.¹⁰⁰⁻¹⁰² “A lot of the technology, in terms of interaction, is not geared around certain economic or cultural groups at all,” says Mr Ahrens.

For example, many mobile health applications tend to skew towards the white population.¹⁰³ As a result, the lack of inclusivity and equity leaves an open, untapped market for digital health applications for minority groups. However, bad UX design can also have serious life-or-death implications. “Bad healthcare UX can kill people,” says Ms Alvarez Trentini. “Medical errors are a leading cause of death, and bad interfaces can easily lead to mistakes—a misplaced button, an obscure pattern, and you can really put people’s lives at risk.” After analyzing 67 studies relating to medical errors and conducting



expert interviews, one assessment concluded that technology development teams need a strong understanding of medical processes and contextual factors.¹⁰⁴ For example, physicians overloaded with reminders and warning messages are likely to disregard alerts.¹⁰⁵

Despite new developments in facial and voice recognition technologies and an increase in the ownership of wearables such as smartwatches, there are still significant challenges for certain populations in terms of access and utilization of such technologies.¹⁰⁶ For example, one study reports that Asian Americans and African Americans were misidentified by facial recognition software at a rate of up to 100 times more than Caucasian people, and one widely recognized speech recognition software is 13% more accurate for men than women.¹⁰⁷⁻¹⁰⁹ In addition, African American populations have faced significant challenges imposed by technology design, including the inability to accurately obtain data for a variety of reasons. Underrepresentation in datasets is one such problem, while problems also exist regarding skin color and 1) measuring digital biomarkers and 2) conducting photoplethysmography (optical heart-rate monitoring). In addition, design issues exist with voice-recognition technology and vocal articulation.^{102,110}

“User feedback is essential for UX. We can only go so far with theory, so it definitely helps to know about user behaviors and patterns. But we constantly need to check our designs against real cases.”

Yisela Alvarez Trentini, UX/UI designer, HCI consultant and anthropologist.

Wearables, facial and voice recognition technologies offer life-saving applications in healthcare, but critical race and gender gaps in the design and deployment of these solutions must be addressed to reduce inequities. “Good health is a basic human right, and that should include the ability to access and use good digital health, too,” says Ms Alvarez Trentini.

To ensure equitable accessibility and experience, technology developers and designers should consider formulating community-led initiatives to actively engage potential users and account for all potential variations of the design.¹¹¹ “User feedback is essential for UX,” says Ms Alvarez Trentini. “We can only go so far with theory, so it definitely helps to know about user behaviors and patterns. But we constantly need to check our designs against real cases.”

This is why human- and community-centered design requires a connection between developers, designers and users to make underserved patients more than a user case—essentially making them the center of the design process by giving them a voice. In addition, involving community members across every development stage can help designers to anticipate potential biases that could be embedded in the design.¹¹¹ As an anthropologist, Ms Alvarez Trentini advocates for the human-centricity of the process. “There is still a problem in the UX world, as many designers feel they can speak for (all) users,” she says. “Training, theory, experience—they help you design better interfaces. But I believe in a human-centric approach.” Co-designing with underserved populations will lead to more equitable user experiences and, in turn, improve accessibility, usage and health outcomes. This must become an industry standard.



While designing digital health technologies may require a more equitable approach, improving trust and acceptance of such technologies is critical to ensure higher levels of engagement among underserved populations. To build the trust, a community-led initiative should promote collaborative participation in technology design, increase involvement in healthcare decision-making, lead to a greater understanding of community needs and ensure that the demographics of healthcare leadership reflect the communities served.^{70,112,113} This will only be possible through multi-stakeholder collaboration.¹¹⁴

KEY TAKEAWAYS

1. User-centered and culturally tailored interventions can lead to greater acceptability of digital health modalities.
2. Human and community-centered design requires a connection between developers, designers and users to make underserved patients the center of the design process by giving them a voice.
3. To build the trust of the community in digital health technologies and increase involvement in the healthcare sector, community-led initiatives should promote collaborative participation in technology design, increase involvement in healthcare decision-making, lead to a greater understanding of community needs and ensure that the demographics of healthcare leadership reflect the communities served.

Pillar 4: Metrics

Production, collection and sharing of data

Patients are producing data when they show up to an appointment, request the refilling of medication on an online portal or even track their weight and steps in a health wellness mobile application. The collection of data is a critical step in the digital ecosystem. If better quality and more comprehensive data are collected, health systems can fill gaps and utilize data to develop strategies to improve health equity.¹¹⁵ That is why the collection of health equity indicators and data on the social determinants of health is crucial to more accurately understanding the state of health equity within a health system. If the data collection process is not transparent, inclusive and interoperable, more data does not equate to better data.¹¹⁶

The collection of data is a critical step in the digital ecosystem. If better quality and more comprehensive data are collected, health systems can fill gaps and utilize data to develop strategies to improve health equity.

The fragmentation of healthcare data reflects the lack of interoperability and exchange of data among healthcare systems and other stakeholders.¹¹⁷ It is important to note that private companies (Amazon Care, Fitbit and Noom, for example) also obtain healthcare data from users and are not required to share it with healthcare systems. Therefore, limited sharing of healthcare data may lead to incomplete information, duplication of testing and other low-value care activities.^{118,119}

Challenges in data production, collection and sharing have led to significant challenges that directly impact digital health equity. For example, digital technologies such as artificial intelligence (AI) are being designed to offer recommendations to support clinical decisions, provide diagnostic results and offer predictive analytics.¹²⁰ Research indicates substantial issues in racial disparities for algorithmic predictions stemming from factors including poor datasets and inequitable design of algorithms.¹²¹ One study analyzed an algorithm currently used nationwide by large healthcare systems on a pool of over 200m patients to alert doctors of high-risk patients.¹²² This algorithm gave African American patients who were sicker than white patients the same risk score, with



the results stemming from healthcare spending data. Racial bias has also been detected in other algorithms, including the Breast Cancer Surveillance Consortium Risk Calculator, the Society of Thoracic Surgeons Short Term Risk Calculator, and estimated glomerular filtration rate (eGFR) MDRD and CKD-EPI equations.^{123,124}

Healthcare systems also collect data on the social determinants of health through electronic health records (EHRs).¹²⁵ Collecting metrics on social determinants of health allows for a more robust and equitable dataset representative of medically underserved communities. Yet so far there has been no uniform or standardized model to collect these metrics.¹²⁵

In the case of both bias in healthcare algorithms and the lack of uniformity in EHRs, better data collection is necessary to understand issues of health equity in communities and provide more (and better) data with which to assess equity and diversity. Experts have been discussing the importance of improving underrepresented data to expand our understanding of

population needs, help improve datasets for AI algorithms, and guide evidence-based reforms. "If technology does not enable some metric of healthcare outcomes to increase, no matter what background of the population, it is failing," says Mr Ahrens. "So the question really should be 'How do we make sure that this technology is serving the population it's targeting?', whether it's communication or a main metric in healthcare outcome." From improving data production for minorities to developing a more inclusive algorithmic design, it is essential for stakeholders to address these issues to ensure better digital health equity.

Studies have reported that user-centered and culturally tailored interventions can lead to greater acceptance of using different digital health modalities. As a result, acceptance is closely linked with collaborative design.^{12,16} For example, despite reportedly being four times more likely to have searched online for information about HIV/AIDS and other STIs and nearly twice as likely to search for general health information online, many members of

the LGBTQIA+ community encounter mental health challenges and are subject to a higher incidence of HIV.^{12,98} Similarly, minorities and immigrants are highly likely to be smartphone-dependent, yet research indicates a significant lack of digital interventions designed for these groups.¹⁰ Mobile technologies can play a critical role in communicating, educating and providing access to highly mobile population groups.⁹⁹ Human- and community-centered design would open access to previously untapped population groups and improve equitable health outcomes.

Mobile technologies can play a critical role in communicating, educating and providing access to highly mobile population groups. Human- and community-centered design would open access to previously untapped population groups and improve equitable health outcomes.

Security and privacy

While there is much that still needs to be done to make the production, collection and sharing of data more equitable, privacy and security issues are at the core of these challenges. For example, in terms of the overarching regulatory bodies and policies that govern digital health privacy and security, studies show that HIPAA has significant gaps: “Neither of these primary goals [to enhance the portability of health insurance coverage and reduce the administrative costs and burdens associated with healthcare delivery] were directed at privacy and security—instead, the privacy and security rules that resulted from the HIPAA law were not discussed in any substantive way in the HIPAA statute,” notes one.⁹¹

After the creation of HIPAA, the HSS, FDA and FTC developed regulatory protections with limited oversight of digital health technologies. The only binding cover entities subject to HIPAA restrictions are “any health plan, healthcare provider, or healthcare clearing house, as those terms are statutorily defined (again, driven by concerns about portability and administrative simplification and not privacy or security).” In 2009 the Health Information Technology for Economic and Clinical Health Act (HITECH) extended cover entities to include “business associates.”⁹¹ Non-covered entities, such as data from digital healthcare mobile applications or smartwatch fitness trackers, are not covered by HIPAA and other privacy-protecting guidelines in the US.

Studies examining data collection and privacy terms of digital applications have concluded that there is a lack of transparency in data collection and that current policies far from offer the necessary protections.¹²⁶⁻¹²⁸ One study proposed that there are five challenges in digital technology data privacy that patients encounter: “invisibility (people unaware of how they are tracked), inaccuracy (flawed data), immortality (data never expire), marketability (data are frequently bought and sold) and identifiability (individuals can be readily re-identified).”¹²⁹ A patient’s digital footprint is not entirely protected, leading to misuse, fraud and adverse events without accountability or transparency.^{72,129} Limited data protections and privacy lapses have critical implications on health equity by lowering trust and engagement among underserved populations.¹²⁹ In addition, ethical challenges arise regarding the production, collecting, storing and sharing of data.⁷⁶

There are new mechanisms, strategies and technologies that aim to improve security. Blockchain is a cross-cutting technology that may offer an opportunity for enhancing

security measures. Its decentralization improves transparency without the need for third-party involvement in data sharing.¹³⁰⁻¹³³ Meanwhile, quantum encryption, while still in its early stages of development, promises to take security to a higher level.¹³⁴ The Health Sector Cybersecurity Coordination Center, an HHS body, is already recommending the development of a working group to evaluate the posture and long-term objectives of the HHS towards quantum cryptography.¹³⁵ Despite various applications and potential impacts on health equity, the integration of cutting-edge security and encryption technologies in the healthcare system is relatively new, meaning that further research is needed to measure its multidimensional impact on securing healthcare.

Stakeholders need to work towards the development of evidence-based, multifaceted and equitable standards, guidelines and policies that encompass the entirety of a patient's involvement in the digital ecosystem.¹³⁶ To do so, there first needs to be better accountability and compliance to protect underserved populations, not merely within the digital health environment but across the entirety of their digital footprint. Accountability is imperative for all stakeholders, from startups that collect sensitive health information from unregulated digital health apps and AI-enabled products to technology giants that develop AI algorithms that are potentially subject to racial bias. Without proper accountability and enforcement, underserved populations will continue to be subject to privacy breaches and trust in the digital health landscape will wither.

Secondly, stakeholders need to collaborate to revamp outdated HIPAA regulations and other peripheral guidelines and policies that are not meeting the demands of the market.^{91,137,138} New applications of digital health technologies are occurring at an unprecedented rate. A streamlined regulatory process is critical to ensure that the necessary protections are meeting the most current challenges of the market and protecting underserved populations. To that end, relevant and enforceable policies and guidelines are necessary for a more safe, trustworthy, ethical, transparent and equitable digital health environment. Once again, this can only happen with multi-stakeholder collaboration.¹³⁹

KEY TAKEAWAYS

1. If the data collection process is not transparent, inclusive and interoperable, more data does not equate to better data.
2. A patient's digital footprint is not entirely protected, leading to misuse, fraud and adverse events without accountability and transparency.
3. Stakeholders need to work towards the development of evidence-based, multifaceted and equitable standards, guidelines and policies that encompass the entirety of a patient's involvement in the digital ecosystem.

The future of digital health equity

Digital health equity is much more than a healthcare concept; it is part of a much larger, complex, multi-sectoral and multi-level health ecosystem. The relationship between digital health and the social determinants of health is bidirectional—improvements in digital health equity will lead to a spill-over effect into each social determinant of health. The journey towards digital health equity also requires the involvement of a diverse group of stakeholders: patients, community leaders, providers, healthcare executives, policymakers and technology developers, among many others.

While this study provides an overview of the challenges and opportunities at the intersection of digital health and equity, the interconnectivity of each domain of digital health and pillar of health equity should be further explored to quantify the multidimensional impacts of digital health on underserved populations. Given the introduction of new legislation directly targeting digital health equity, the US political landscape looks promising. However, it is critical to put the patient at the center of any guideline and policy, which is currently often overlooked. Patient centricity is a tenet of value-based care, and if healthcare systems are moving towards a value-based system, digital health equity should be at the center of their goal.

This report acknowledges improvements made over the last decade toward the creation of a more equitable healthcare system; however, there is still much work to be done. Technology will continue to rapidly advance, and if gaps in digital health equity are not intentionally addressed, current inequities will only be exacerbated. The future is hopeful for digital health equity, but it is up to all stakeholders to collaboratively forge a more equitable path forward.



RECOMMENDATIONS: FROM LESSONS TO ACTION

1. Since digital health equity is part of a much larger, complex, multi-sectoral and multi-level digital ecosystem, it is important to understand its direct and indirect impact on the different domains of health. Further research is necessary to quantify the direct impact of improvements in digital health equity on each social determinant of health.
2. Inclusion is required for any successful impact in improving digital health equity. It is inefficient and ineffective to offer solutions without including those most impacted in decision-making. It is essential to increase the diverse representation of underserved populations in positions of decision-making, ranging from healthcare executives to directors.
3. User- and community-centered engagement are essential to understand population needs and develop effective and actionable strategies. Inclusion of underserved groups and respective community leaders in the technology design phase is critical to increasing engagement. This should be the industry standard.
4. Current policies, standards and guidelines need to be updated to ensure that actions are taken to improve infrastructure and access, protect medically underserved populations and enforce greater accountability. HIPAA needs to be revisited and policymakers should consider supporting legislation that focuses on expanding access and enhancing protections for underserved populations, such as the Digital Equity Act of 2021.



Appendix: Methodology

This project conducted a comprehensive literature review in scientific databases to explore: 1) critical gaps in accessing equitable care within the US health system, 2) current guidelines and policies for digital health within the US health system, 3) proposed solutions to address health inequity through technology, and 4) recommendations based on the Digital Health Equity framework developed by Economist Impact.

In addition, a gray literature search was conducted to retrieve policies, guidelines and targeted information that were not uncovered by previously selected methods to investigate inequities within the US healthcare system, the building blocks of equitable care and the impacts of digital health technologies. Finally, our research team conducted five expert interviews to obtain the latest industry-specific information and complement the literature review. Looking across key domains of digital health and pillars of an equitable health system, we examined the interplay between these factors (Figure 2).

Appendix: Extended Recommendations

Pillar 1: Empowerment and access

- At the community level, the government should expand digital literacy programs in public libraries, schools and local venues by reinstating the Community Technology Centers program and creating other industry-based partnerships.
- Health professionals should also obtain relevant digital health literacy sensitivity training to assist patients in navigating the digital health ecosystem and offer tailored digital health information based on each patient's level of digital health literacy.
- Government should extend Medicare/Medicaid coverage to all modalities of digital care, incentivize providers through new payment models to utilize telehealth, and expand reimbursement and subsidies for low-income populations.
- Developers should ensure that digital technologies are compatible with all devices, offer translation extensions and plugins for digital health information and services, and offer multilingual and multimodal support that considers different levels of digital literacy.

Pillar 2: Accountability and justice

- Healthcare systems must have equity as a long-term priority, and equity in digital health interventions should be at the forefront of actionable strategy when organizations are considering equity gaps.
- Partnerships should develop culturally sensitive patient education and training to improve patient understanding and help to develop digital literacy skills.
- Policymakers should ensure that the development of new laws incorporate the voice of all stakeholders, especially underserved patients.

Pillar 3: Community and leadership

- Technology developers and designers should consider formulating community-led initiatives to actively engage potential users and account for all potential variations of the design.
- Community members should be involved across every development stage to help to anticipate potential biases that could be embedded in the design.
- Community-led initiatives should promote collaborative participation in technology design, increase involvement in healthcare decision-making, seek a greater understanding of community needs and ensure that the demographics of healthcare leadership reflect the community that they serve.

Pillar 4: Metrics

- Collecting metrics on social determinants of health will allow for a more robust and equitable dataset representative of medically underserved communities.
- The fragmentation of healthcare data reflects the lack of interoperability and exchange of data among healthcare systems and other involved stakeholders. Collaboration through information sharing is a critical component to improving the quantity and quality of data.
- Better accountability and compliance is needed to protect underserved populations, not merely within the digital health environment, but across the entirety of their digital footprint.
- Stakeholders need to collaborate to revamp outdated HIPAA regulations and other peripheral guidelines and policies that are not meeting the demands of the market. To that end, relevant and enforceable policies and guidelines are necessary for a more safe, trustworthy, ethical, transparent and equitable digital health environment.

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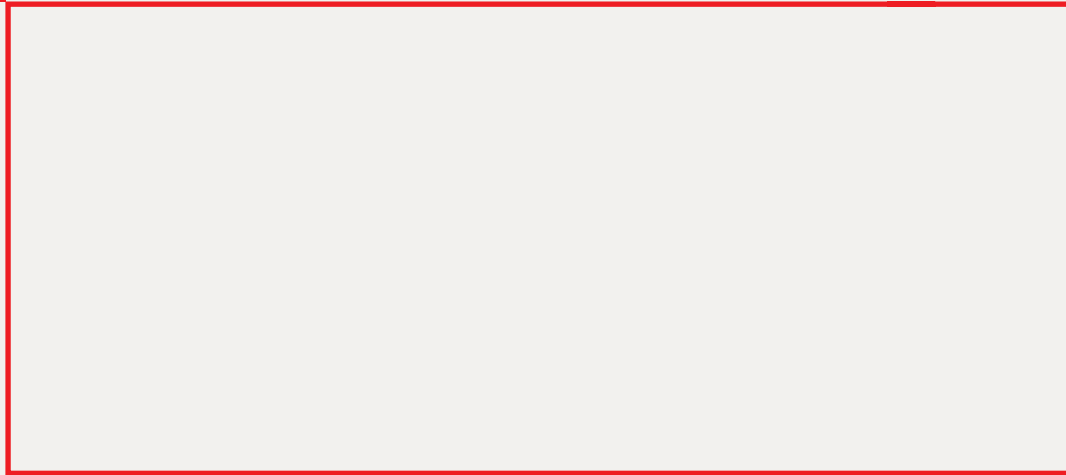
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