BIG TECH IN HEALTHCARE: How Alphabet, Amazon, Apple, and Microsoft are shaking up healthcare and what it means for the future of the industry

Laurie Beaver | July 18, 2018

KEY POINTS

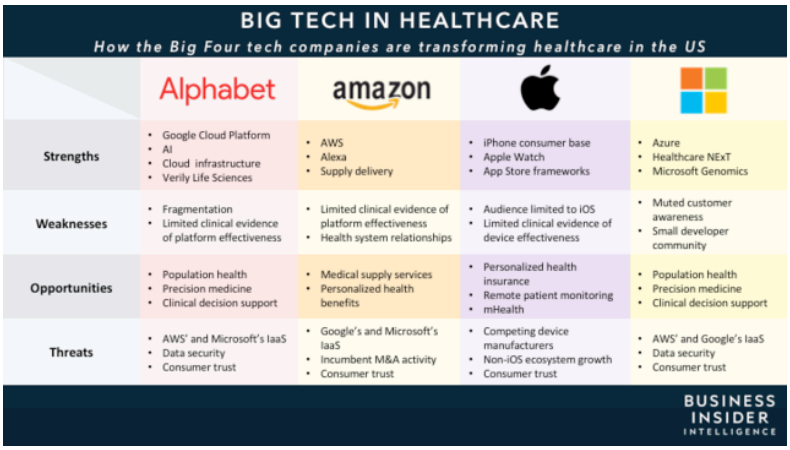
- **The healthcare industry is undergoing a profound transformation.** Costs are skyrocketing, consumer demand for more accessible care is growing rapidly, and health systems are unable to keep up. Healthcare expenditures currently account for almost 20% of US gross domestic product (GDP), and they're projected to reach 25% by 2025. For comparison, healthcare spend in the UK made up less than 10% of GDP in 2015 — the most recent results available.
- **Health organizations are increasingly turning to tech companies to facilitate this transformation in care delivery and lower health expenditures.** Tech companies' expertise in data management and analysis, along with their significant compute power, can help support healthcare payers, health systems, and consumers by providing a broader overview of how health is accessed and delivered. This will allow insurers and payers to better provide positive outcomes for patients, which will help lower health expenditures.
- **Seeing an opportunity to tap into the lucrative healthcare market, four of the largest US tech companies — Alphabet, Amazon, Apple, and Microsoft — are accelerating their health-focused efforts.** And they're increasingly investing in health startups. In 2017, 10 of the largest tech companies in the United States were involved in healthcare funding worth $2.7 billion, up from just $277 million in 2012, according to data from CB Insights.
    - **Alphabet is leveraging its dominance in data storage and analytics to become the leader in population health.** Specifically, the company is leaning on its cloud platform to drive strategic health system partnerships by solving health systems' issues with electronic health record (EHR) interoperability and limited computing infrastructure.

    - **Amazon is leaning on its experience as an e-commerce and distribution platform for medical supplies and pharmaceuticals.** The e-commerce giant is also developing its artificial intelligence (AI) assistant Alexa as an in-home health concierge to help drive consumers to use the online shopping platform for prescriptions and basic medical supplies.
    - **Apple is striving to turn its consumer products into patient health hubs.** The company is relying on its substantial footprint in smartphones and wearables to make its devices powerful healthcare tools that benefit both providers and payers.
    - **Microsoft's focusing on cloud storage and analytics to tap into precision medicine and population health.** Azure, the company's intelligent cloud service, enables providers and payers to target specific pockets of populations for better health outcomes.
- **Health organizations can further tap into this opportunity to collaborate with tech giants to realize cost savings and bolster their top lines.** But understanding how each tech giant is approaching healthcare is crucial. Each tech company is relying on its own expertise to corner off a segment of the $3 trillion US healthcare market. This differentiation will impact health organizations in different ways.
- **Incumbent pushback and consumer trust are two hurdles that could impede big tech companies' dominance in the healthcare industry and need to be overcome.** The importance of consumer and industry trust can't be overstated amid ongoing issues surrounding data security, consumer privacy, and compliance issues. Other barriers, such as physician resistance to change and data security concerns, could also inhibit tech companies' impending movement into healthcare.

Introduction

The healthcare industry is undergoing a profound, and necessary, transformation. Healthcare costs are ballooning, the global population is getting older — chronic diseases are expected to rise with it — and consumer demand for more accessible care is growing. Annual healthcare spend in the US has already surpassed $3 trillion and is projected to grow a further 5.4% in 2018, according to the Centers for Medicare and Medicaid Services (CMS).

Health organizations have an opportunity to collaborate with tech giants to realize cost savings and bolster their top lines. The potential for tech-led digital health initiatives to help healthcare providers and insurers deliver safer, more efficient, and cost-effective care is significant. For healthcare organizations of all types, the collection of patient data can minimize avoidable service use, improve health outcomes, and promote patient independence, which can assuage swelling costs.



For their part, the "Big Four" tech companies — Google-parent Alphabet, Amazon, Apple, and Microsoft — see an opportunity to tap into the lucrative health market. These same players are accelerating their efforts to reshape healthcare by developing and collaborating on new tools for consumers, medical professionals, and insurers. For instance, in 2017, 10 of the largest tech companies in the US were involved in healthcare funding worth $2.7 billion, up from just $277 million in 2012, according to investment database CB Insights.

In this report, Business Insider Intelligence explores the key strengths and offerings the Bif Four will bring to the healthcare industry, as well as their approaches into the market. We'll then explore how these services and solutions are creating opportunities for health systems and insurers. Finally, the report will outline the barriers that are inhibiting the adoption and usage of the Big Four tech companies' offerings and how these barriers can be circumvented.

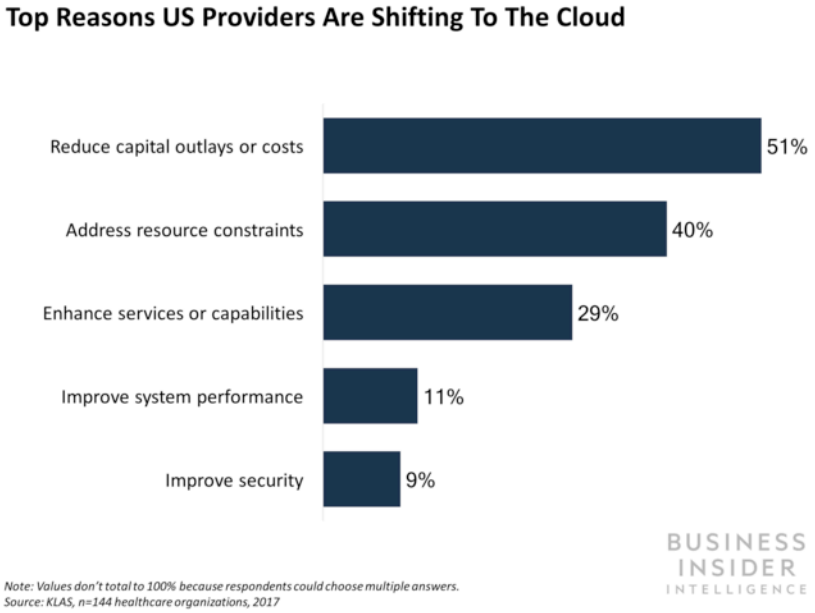
Note that while this report highlights the developments of big tech companies' larger, more intimate role in the healthcare industry over the past few years, the market is changing at lightning speed and new breakthroughs are happening every day. The information in this report is up to date through mid-July 2018. To stay abreast of developments in this space in real time, please monitor Business Insider Intelligence's Digital Health Briefing.

The Digitization Of Healthcare

Several emerging consumer and professional healthcare trends, which dovetail with advances in health technology, have paved the way for tech

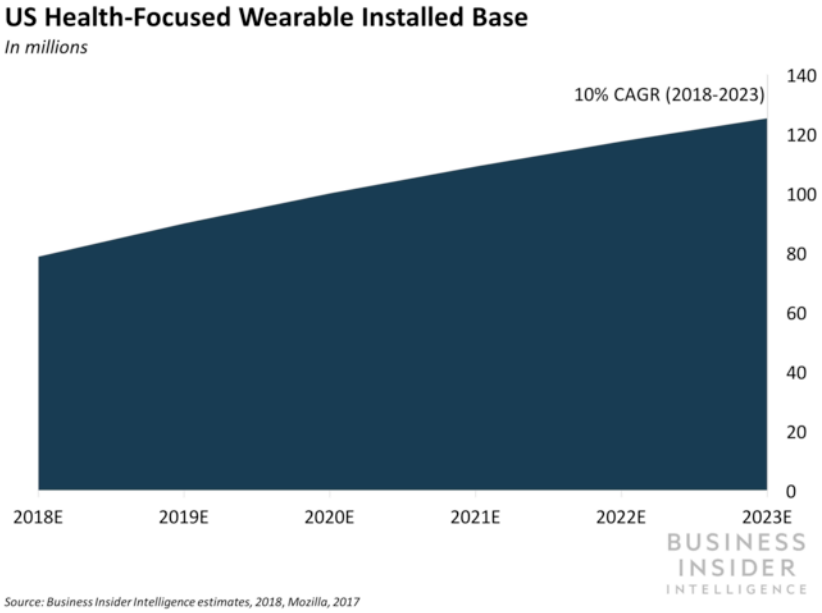
companies' entrance into the healthcare market:

- **Health systems' broad implementation of public cloud computing.** Hospital networks and clinics are shifting data storage to the cloud to reduce capital costs, address resource constraints, and enhance services and capabilities, [according] to KLAS. Additionally, cloud computing often provides health systems with advanced artificial intelligence (AI) capabilities that can enhance big data analysis and provide insurers and health systems with actionable insights into consumer behavior that will help power precision medicine and population health management.



- **The emergence of new electronic health record (EHR) standards that emphasize interoperability.** For example, Fast Healthcare Interoperability Resources (FHIR) is a draft standard that enables health IT developers to more quickly build apps for EHRs that can make sharing health data easier between apps and services; this gives providers, insurers, and consumers more access to the full gamut of patient data. For instance, an update to Apple's Health Records app is implementing FHIR to make it easier for patients and hospitals to share patient data, which they can store in the app and share with their physicians. The adoption of this standard makes tech companies' products, such as cloud computing and smartphones, the perfect channel to reach consumers.
- **The quantified-self (QS) is becoming the norm among**

consumers. Consumer interest in tracking and measuring (quantifying) their health through the monitoring of behavior or biometric performance has helped propel demand for health- and fitness-tracking services, such as the Apple Watch or Fitbit and apps like MyFitnessPal. QS data collected from these apps and devices can be shared with insurers and providers to offer a fuller picture of a patient's health and give insights into their behavior outside of a clinical setting. Business Insider Intelligence projects the US health-related wearables installed base to grow at an annualized rate of 10% between 2018 and 2023 to reach 125.3 million devices.



- **Ballooning healthcare costs.** Healthcare expenditures currently account for almost 20% of the US gross domestic product (GDP), and they're projected to reach 25% of the US GDP by 2025. For comparison, healthcare spend in the UK made up less than 10% of the GDP in 2015 — the most recent results available. Some healthcare organizations, including providers and insurers, have turned to technology such as wearables and remote patient monitoring (RPM) devices to help assuage the need for urgent and emergency care, in turn mitigating unnecessary costs.

Tech companies are exploiting these trends to highlight key areas in which their offerings can help healthcare organizations continue to deliver care while also maintaining their top lines. Among tech companies, Alphabet, Amazon, Apple, and Microsoft are showing the greatest potential to

meaningfully transform the healthcare market through a combination of their industry-leading technology, robust patent portfolios, and substantial consumer reach. Because of this, these big tech companies are forcing healthcare incumbents to shore up their offerings, while also providing an avenue for partnerships that will drive innovation within the healthcare market.

Alphabet

Alphabet is focusing on its dominance in AI, data storage, and analytics to become the leader in precision medicine, population health, and health data management. The company has four businesses with a dedicated focus on healthcare — Google, Verily Life Sciences, Calico, and DeepMind. Each is investigating how its particular technology can empower health insurers, health systems, and consumers to improve healthcare outcomes, deliver more accurate clinical predictions, and lower overall healthcare costs.

Efforts In Healthcare

Google

Even as Google fits into Alphabet's larger ecosystem of health initiatives, the search giant itself is pursuing several channels within healthcare, including Google Cloud for Healthcare, Google Fit and Google Research for app development, and Google Search to provide consumers with health cards and symptom information.

- **Google is seeing how its AI offerings can be used by health systems to better manage care and improve clinical patient flow.** The company teamed up with the University of California, Stanford

University, and the University of Chicago to develop an AI system that predicts the outcomes of hospital visits, exploring how to prevent hospital readmissions and reduce lengths of stays, which could help to dramatically lower total healthcare costs, for example.

- **Google Cloud for Healthcare was introduced during the HIMSS 2018 conference in March 2018, with the aim to make it easier for health organizations to collect, store, and access health data.** The application programming interface (API) will extract data from Google Cloud customers' EHRs using machine learning. Algorithms will then use the data to create actionable insights for providers to better support clinical decisions and treatment plans. Google is trialing the Cloud Healthcare API with a select group of partners in the US, such as the Stanford School of Medicine, with plans to roll out the product more broadly over the next 12 months.
- **Google Fit is Google's response to Apple's HealthKit, and enables Android users to pair their devices with their phones to track activity, such as how long they've exercised for, how many steps they've taken, and how many calories they've burned.** The platform has partnered with several device makers, including Nike, HTC, and Motorola. This business addresses the QS movement, ensuring Android devices have a platform to house user-generated health data. It's possible that Google could open the Fit platform the same way Apple has opened its Health Records app to developers to broaden access of patient EHRs for providers in the US.
- **Google's research team is looking at ways the business' deep learning and machine learning services can automate aspects of the healthcare industry and improve clinical operational workflows.** In 2016, the team of researchers exploredhow computer-aided diagnostic screening could be applied to ophthalmology for diabetic eye disease to help specialists handle the large volume of screenings needed, for example.
- **Google is using the prevalence of its search engine to raise awareness for mental health.** The company partnered with two US groups, the National Alliance on Mental Illness (NAMI) and the National Center for post-traumatic stress disorder (PTSD), to introduce a new

Search feature that could help people identify if they suffer from the disorder, for example.

Verily Life Sciences

Alphabet's Life Sciences business is focusing on managing and preventing diseases that affect large populations, such as diabetes. Verily's healthcare strategy differs from other tech giants' because it aims to complement traditional healthcare companies' offerings,
whereas Amazon's and Apple's solutions would enable them to circumnavigate or even cut out traditional firms and middlemen.
The business partnered with several healthcare organizations to run longitudinal studies that aim to better understand how to predict and prevent the onset and progression of these diseases.

- **Verily partnered with drug maker Dexcom to develop miniaturized continuous glucose monitors (CGM).** The aim is to reduce the cost and size of body-worn CGM for consumers with type 2 diabetes. This can make it easier for patients with the disease to monitor and manage their blood sugar levels, while also providing physicians and healthcare professionals with timely, actionable patient data outside of the clinical setting. The annual costs associated with diabetes in the US rose 26% between 2012 and 2017, up to $327 million in 2017, according to the American Diabetes Association.
- **A collaboration between Verily and biopharmaceutical firm Gilead Sciences aims to identify the genomic cause of three inflammatory diseases: rheumatoid arthritis, inflammatory bowel disease, and lupus-related diseases.** The companies are hoping the study will yield results that can help physicians more accurately select therapies for specific subgroups of patients. Effective treatment of inflammatory diseases could mitigate rising health costs in the US — Lupus costs around $38 billion in annual health expenditure each year, according to OnHealth.

In July 2018, Verily announced that it will be spinning out a joint venture (JV) with ResMed — a high-end sleep-tracking device company — to tackle sleep apnea. The venture will combine Verily's expertise in data analytics with ResMed's network of remote patient

monitoring (RPM) devices to help treat the 54 million Americans who suffer from sleep apnea. The companies are also aiming to cut into the $150 billion in annual US economic costs from undiagnosed sleep apnea. Insurers will likely be interested in the JV's proposition — sleep apnea is associated with expensive chronic diseases like diabetes and heart disease.

Verily's not the first tech company to hone in on sleep disorders as a potential revenue opportunity. Apple, Garmin, and Fitbit are all exploring how their wearable devices can contribute to managing sleep disorders. Verily's approach — joining forces with ResMed's specialized, high-end devices — grants the company access to an established line of devices that aren't in direct competition with the other tech giants' wearable offerings. Moreover, Verily could eventually look to integrate ResMed's cloud-connected devices into the Google Cloud for Healthcare platform, which the JV could use to offer health systems and insurers real-time insights into patient sleeping data.

Calico

Biotech business Calico primarily focuses on researching and developing technology that tackles aging and the processes that inhibit people's lifespans. The company investigates areas it hopes will improve consumers' overall health, such as preventative measures for chronic illnesses as well as genomic and molecular data for precision medicine that can take on neurodegeneration.

- **In June 2018, Calico and biopharmaceutical company AbbVie announced a $1 billion extension to their 2014 partnership that aims to discover and develop new therapies for patients with age-related diseases such as cancer.** Each company added $500 million into the research collaboration — Calico leads the discovery-stage research and proof-of-concept work, while AbbVie puts the new treatments through drug trials and to market. Thus far, the partnership has yielded more than 24 different programs exploring aging and disease.

DeepMind

Alphabet's London-based AI company focuses on how it can apply artificial

neural networks to a broad range of business areas, including healthcare. DeepMind is working closely with the UK National Health Service (NHS) to find ways that AI can expedite clinical work processes, allowing clinicians to quickly move patients through the health system from diagnosis to treatment. That includes providing AI-enabled clinical decision support (CDS) to make diagnoses more accurate and efficient as well as providing data-driven insights to power population health and precision medicine.

- **In July 2016, DeepMind and London-based Moorfields Eye Hospital announced a partnership to train an AI system to detect eye diseases such as macular degeneration and diabetes-related blindness.** At the time, Google estimated that around 98% of sight loss is a result of diabetes that could be prevented with early treatment. The partnership submitted "promising signs" from the studies in 2018 with hopes that the technology could enter clinical trials within the next few years, according to Financial Times.

Biggest Potential Impacts

Health Systems

Google's cloud infrastructure can offer health systems data storage, compute power, and advanced analytics. These services will help health systems analyze massive volumes of data that can be used to provide CDS through the automation of medical imaging, by predicting medical outcomes that can help improve efficiencies in the hospital setting, and by parsing genomic data for precision medicine. Overall, AI has the potential to improve outcomes by up to 40% and reduce treatment costs by 50%, according to Frost and Sullivan.

Google is forging ahead with partnerships that will further entrench its position as a leader in the healthcare cloud market. For instance, in November 2017, the company announced strategic partnerships with Change Healthcare, Nautilus Medical, and Ambra Health aimed at improving radiology workflows, lowering overall healthcare costs, and advancing medical imaging processes through machine learning.

The global cloud healthcare market is projected to grow at a compound annualized rate of 21% between 2015 and 2020 to reach $9.5 billion, according to MarketsAndMarkets. To capture a significant share of this market, it's likely Google will continue to aggressively build out its

network through partnerships.

Health Insurers

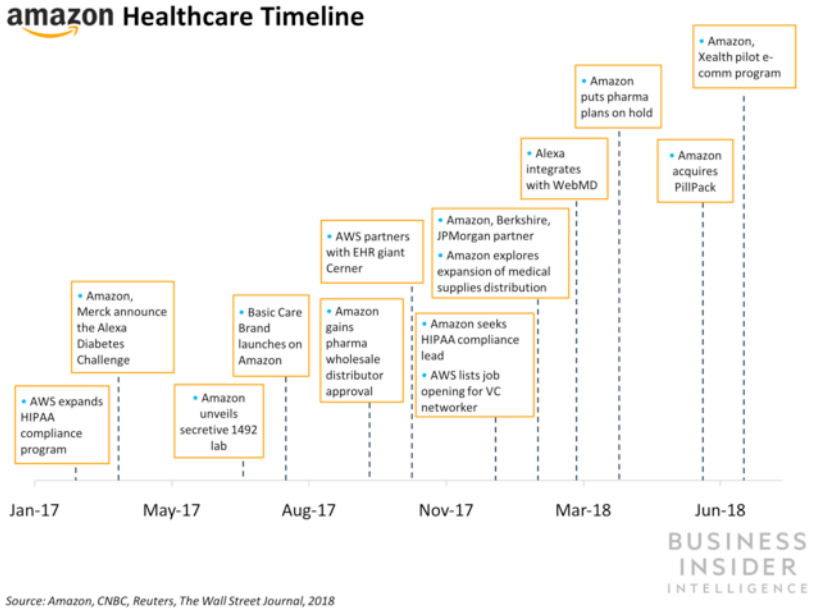
Alphabet's focus on population health management will likely have the biggest repercussions on the health insurance market. The company's early, varied, and extensive moves in this field are establishing its position as a market leader and will make it attractive to each of the biggest insurers in the US, which are putting a bigger emphasis on population health to create revenue opportunities and cost savings. Eighty percent of payers believe that addressing their beneficiary populations' social determinants of health will be a key way to improve their population health programs, according to Change Healthcare.

Verily's early efforts, for instance, could give it a competitive edge as it begins forging strategic partnerships with health insurers. For example, the company could use its ability to gather and analyze massive sets of data to identify at-risk patients and the types of care they would most benefit from, driving down future costs for insurers in the process. For its part, Verily would get a share of these savings and build a presence in the growing population health management market, which is projected to reach $42.5 billion by 2021 from $13.9 billion in 2016, according to MarketsandMarkets. The company is already in talks with insurers about jointly bidding for contracts in which it would take on risk for hundreds of thousands of patients, according to CNBC.

And its impact will extend beyond the private insurance industry, as payers across the board, including government-sponsored initiatives and employers, seek to lower costs related to preventable disease outbreaks and poorly managed chronic illnesses. For example, data could be used to help patients better manage diabetes proactively to prevent costs arising from potential complications of the chronic disease.

Amazon

Amazon is taking a multipronged approach to the healthcare market, and has accelerated these efforts over the past 18 months. The company is leaning on its significant cloud footprint — Amazon Web Services (AWS) is the largest cloud provider globally — its experience as a distribution platform, and Alexa, the company's AI assistant.



Source: Amazon, CNBC, Reuters, The Wall Street Journal, 2018

Efforts In Healthcare

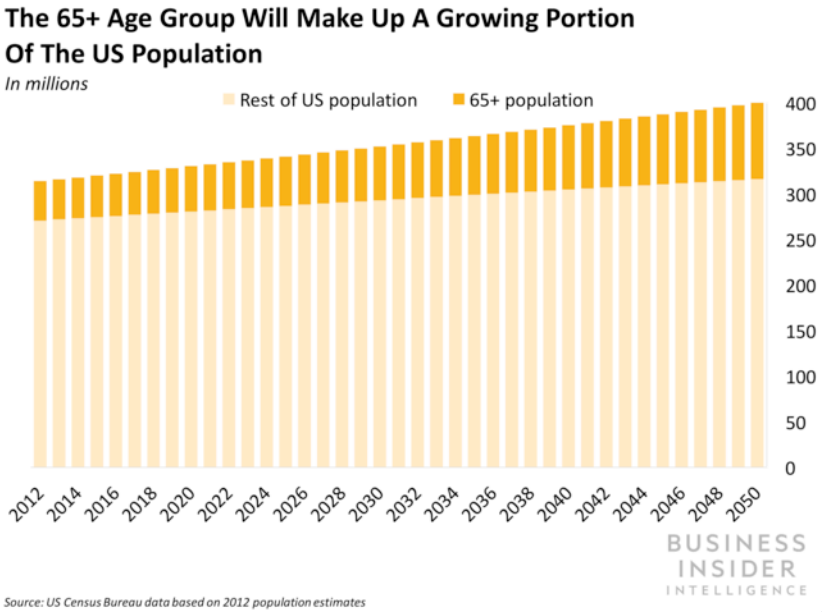
Alexa

Healthcare is one way the company could further entrench Alexa in consumers' lives. Around 80% of internet users have searched for health-related issues online, according to a Pew study. One scenario might see Alexa reminding patients with chronic illnesses to take their medication or measuring vital signs. In the US, chronic diseases and the health risk behaviors that cause them account for most healthcare costs, according to

the Centers for Disease and Control Prevention (CDC).

Amazon has taken several steps over the past year to expand the health capabilities of its voice assistant, primarily aimed at addressing the chronic illness market:

- Amazon partnered with pharmaceutical giant Merck last year to launch the Alexa Diabetes Challenge, in which challengers developed Alexa skills (i.e. voice apps) that make it easier for Alexa users to manage their diabetes symptoms.
- The company posted a job listing for an expert on the Health Insurance Portability and Accountability Act (HIPAA) earlier this year, likely to explore Alexa's potential role in the healthcare market.
- Earlier this year, Amazon was reportedly developing Alexa features that target seniors, who make up the largest portion of chronic illness sufferers. The growing US senior population means there's a large market for in-home elderly care, including chronic illness management and medication-adherence services. The number of people in the US aged 65 years and older is projected to reach nearly 84 million by 2050, which is almost double the number in 2012, according to US census estimates. This same segment of consumers will also account for a larger portion of overall US consumers, making up 21% of the total population by 2050, compared with 15% in 2018.



Amazon Web Services (AWS)

Amazon has also taken strides to win favor with vendors in the

healthcare cloud market. The platform collects data from many different sources, including EHRs and insurance claims, to enable healthcare providers to identify and predict risks to individuals or populations. This helps caregivers make better-informed decisions when selecting care programs.

- In November 2017, the company announced a partnership with healthcare tech giant Cerner to help medical providers use patient data to make more effective health predictions.
- Amazon's cloud-computing business announced in 2017 that Amazon API Gateway, AWS Direct Connect, AWS Database Migration Service, and Amazon Simple Queue Service (SQS) were all HIPAA-compliant, enabling health systems and affiliated healthcare organizations to more easily move their data to AWS.

Amazon Business Platform And Medical Supplies Delivery

Shipping devices and supplies is the path of least resistance for Amazon as it dips its toes into the healthcare industry:

- **The majority of hospitals and clinics surveyed are supportive.** Sixty-two percent of healthcare organizations view a potential move by Amazon as positive for the medical industry, likely because the company could streamline the delivery process, according to Reaction Data.
- **Amazon could undercut traditional suppliers.** If Amazon could bring its retail model to medical deliveries, it could drive down prices and push out competitors. Supply expenses rank second after labor for hospital spending, according to Healthcare Dive.
- **Amazon already has its footing in the medical supply field.** Amazon Business partnered with a large, undisclosed US health system in the Midwest to test delivering health supplies earlier this year, according to The Wall Street Journal.

The Amazon, Berkshire Hathaway, And JPMorgan Chase Partnership

Amazon, investment giant Berkshire Hathaway, and leading US bank JPMorgan Chase partnered in January to form an independent healthcare company to address the needs of their US employees. Few details were provided about how the newly formed company would be approaching the healthcare industry, and while it's not a nonprofit, the new firm aims to be

"free from profit-making incentives," as it seeks to improve employee satisfaction by providing high-quality, transparent care at a reasonable cost. The companies appointed Dr. Atul Gawande as the head of their newly formed healthcare company in June 2018. Dr. Gawande's appointment could provide some insight into the possible avenues the partnership will explore. Gawande brings a background in surgery and a focus on improving the delivery of care to the partnership. Perhaps most indicative of the JV's future endeavors is Gawande's role as founding executive director of Ariadne Labs, a Boston-based innovation lab focused on improving the delivery of care of serious illnesses, childbirth, and surgery — three areas that have a significant role in employer-based healthcare spending.

Retail Pharmaceuticals

In June 2018, shortly after Amazon seemingly nixed its pharmaceutical plans, the company announced plans to acquire online pharmacy startup PillPack in its latest dive into the healthcare market, according to Bloomberg. PillPack aims to make it easier to order and receive medication by packaging pills together and delivering them to consumers' homes. PillPack already has licenses to ship prescriptions in every US state; acquiring PillPack's pharmacy network saves Amazon from paying out the vast legal and logistical expenses needed to comply with a notoriously heavily regulated industry.

Amazon began trialing a service in July 2018 that will enable doctors to "prescribe" bundles of medical supplies to patients before they're discharged — orders which Amazon will then deliver to patients' homes, according to CNBC. Amazon will likely tie its recent acquisition of PillPack to include prescription delivery in the service. The pilot, headed by Xealth, a Seattle-based digital content delivery platform, will roll out at Providence Health System and University of Pittsburgh Medical Center in the coming months, with the intention of scaling to other US health systems.

Biggest Potential Impacts

Health Systems

Amazon's presence in the medical supply business will be particularly beneficial for health systems since it could drive down costs for

hospitals and clinics. Hospital purchasing is typically structured around contracts between hospital systems, distributors, and manufacturers. These transactions often come with additional costs, which can significantly increase the price of supplies — fees and administration, marketing, and shipping costs account for 20-30% of healthcare supply costs, according to an estimate by Citigroup.

Providing hospital systems with direct access to multiple manufacturers and an easy way to compare their prices will lead to more competitive pricing on medical supplies. This will not only reduce the direct cost of supplies, but also cut out other fees, such as those paid to middlemen that facilitate medical supply transactions.

Health Insurers

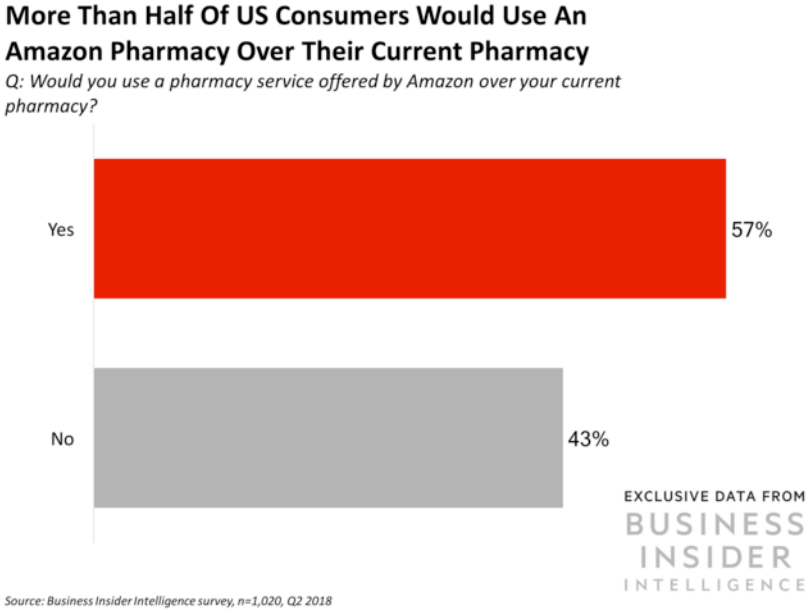
The JV between Amazon, JPMorgan, and Berkshire will likely have significant repercussions, particularly for employer-based health insurance initiatives, which are gaining steam in the US. More and more employers have elected to self-insure over the past decade, and these firms have a good incentive to get a handle on the healthcare costs of their employees — US employers contributed more than $13,000 per covered worker with a family health plan in 2017, according to Kaiser Family Foundation estimates. That's up about 60% from 2006. With more than 1 million combined employees, the corporate trio has a strong incentive to reduce healthcare spending.

At first, the newly formed firm will focus on the employees of the three companies. But it could expand to a much larger audience — the goal is to create solutions that potentially benefit "all Americans," according to JPMorgan Chase CEO Jamie Dimon. To accomplish this, each firm will lean on the unique health solutions they already deploy: Chase offers payment processing services for both providers and payers, Berkshire offers healthcare liability insurance to providers through MedPro Group, and Amazon offers healthcare-specific cloud solutions.

Pharmaceuticals

Amazon's acquisition of PillPack could position the e-commerce giant to take on the retail pharmaceutical industry, particularly CVS, Rite Aid, and Walgreens. In an informal survey of Business Insider readers, Business Insider Intelligence found that the majority of respondents (57%)

would use a pharmacy service offered by Amazon over their current pharmacy. The data isn't representative of the general population — Business Insider readers tend to be younger, male, and tech-savvy. Still, we think the data provides a strong indicator that retail pharmaceuticals will be one of the next industries to get "Amazon'd," as Amazon will rock the boat in digital shopping for medical supplies and over-the-counter pharmaceuticals in the same way it disrupted online grocery shopping.



Apple

Apple is striving to turn its consumer products into patient health hubs. Specifically, the company is developing its health strategy around two existing segments: Mobile and the App Store.

Efforts In Healthcare

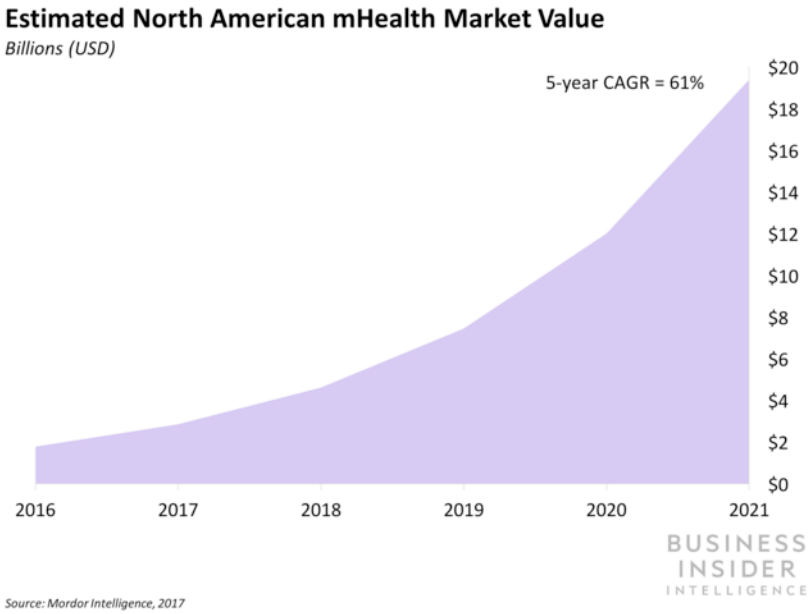
Mobile Offerings

The company's main mobile offerings, the iPhone and Apple Watch, provide healthcare organizations with a window into consumers' behaviors outside of the clinical setting:

- **The iPhone is being turned into a powerful repository for personal health data.** An update to the Health Records app was launched in January 2018 to make it easier for iPhone users to consolidate, access, and share their health data from more than 500 hospitals and clinics in the US.
- **The Apple Watch is involved in several studies to provide insurers and providers with continuous health data, such as for heart conditions.** Apple launched the Apple Heart Study app in November 2017 to monitor users' heart rhythms using the Apple Watch heart rate sensor and alert users who are experiencing Atrial Fibrillation (AFib), for example.

The App Store

With the proliferation of smartphones and wearables, the mobile health (mHealth) market continues to gain momentum. The North American mHealth market is set to grow at an annualized rate of 61% to reach $19.4 billion by 2021, up from $1.8 billion in 2016, according to Mordor Intelligence.



Coupled with its robust consumer base in the US — Apple controls more than half of the US smartphone market — the company's four health-based developer frameworks, HealthKit, ResearchKit, CareKit, and Health Records, allow developers and healthcare professionals to tap into and leverage the wealth of health data stored in consumers' devices, making the company an attractive platform to providers and insurers.

- **Apple unveiled HealthKit in 2014,** a software development platform for building apps that collect and share personal health and fitness information across other apps via wearable or mobile devices.
- **Apple announced ResearchKit in 2015,** a development platform for medical researchers to build apps that make it easier to conduct clinical studies that leverage the iPhone and Apple Watch.
- **In 2016, Apple unveiled CareKit for app developers to create experiences that enable consumers to manage their own health.** In a recent example, CareKit was used to develop the Sharp Healthcare Companion App to aid patients during their surgery experience by giving them important presurgery and postsurgery reminders, allowing them to monitor their own health, and enabling them to share health data with clinicians. In a pilot that included 32 cataract surgery patients, the new app saw positive outcomes: 90% of patients found that the app gave them a better understanding of postsurgery instructions, and 97% said they would use the app for other procedures or surgeries.

- **Launched in January 2018, Health Records enables US iOS device users to share their health record data, including medications, immunizations, lab results, and vitals, with providers.** An API was released for Health Records in June, enabling developers to use this data to create more personalized health experiences.

Biggest Potential Impacts

Health Systems

For health systems, Apple's products pave the way for improved patient care by filling in the gaps in patient information and enhancing data interoperability. Doctors and health practices are looking to use digital technologies to reduce operational costs. One of the best ways to do that is by making care preventive rather than reactive, which generally leads to lower costs and fewer hospitalizations as problems are identified early. Wearables can enable remote monitoring that can be used to identify problems early as well as cut down on the need for costly and time-consuming office visits. And they're starting to catch on among health systems in the US, according to a survey by Accenture.

- **Ninety-one percent of healthcare providers surveyed said wearables are a component of their IoT health solutions.**
- **Among this group, 42% provide devices to patients, while another 28% provide a subsidy to patients who buy them.** These providers see value in wearables as part of preventive care and are taking active steps to facilitate getting them into patients' hands.

Health Insurers

A host of health insurers have partnered with Apple to explore how the Apple Watch can encourage consumers to make healthier life choices by offering incentives such as personalized health plans or by providing discounts on their health plans for reaching specific exercise milestones that help to better manage chronic illnesses. For example, Apple partnered with Aetna to offer the device at a discount to incentivize customers to reach certain step milestones. UnitedHealthcare, Aetna, and John Hancock recently added the Apple Watch Series 3 to their discount programs, according to Apple Insider.

- **Better self-care could reduce the volume and frequency of claims payouts from unnecessary trips to urgent care due to**

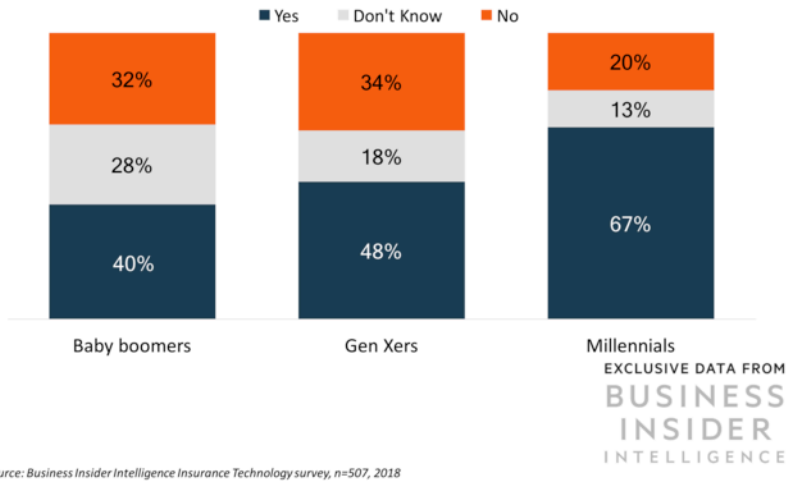
chronic illness management. Chronic disease and mental illness account for 86% of healthcare costs in the US, according to the CDC.

- **Payers can use customer-generated wearable data for targeting medical costs.** Identifying consumers that are at high risk of developing chronic illnesses empowers insurers to be proactive about healthcare initiatives that can improve patient outcomes. These users account for 17% of overall members, but take up 43% of claims, according to NCBI.

Millennials are particularly receptive to using a wearable to receive health plan benefits, according to the 2018 Business Insider InsurTech survey. Sixty-seven percent of millennial participants said they would be willing to use a wearable in exchange for a personalized health plan. As the generation ages, the way they interact and engage with healthcare organizations now will have a distinct role in defining how the market plays out in the future.

US Consumer Willingness To Use A Wearable In Exchange For A Personalized Health Policy

Q: Thinking of your insurance, would you wear a fitness tracker to monitor your health in exchange for a personalized policy?



Source: Business Insider Intelligence Insurance Technology survey, n=507, 2018

Microsoft

Microsoft focuses on cloud storage and analytics to provide health systems and insurers with predictive and precision medicine as well as population health. It houses the larger share of these efforts within its Healthcare NExT program, which aids in providing the company with a focused brand as it explores how its tech can be used within the healthcare setting.

Efforts In Healthcare

Healthcare NExT

Microsoft launched Healthcare NExT in February 2017 with the aim of leveraging its AI and cloud-computing platforms to drive healthcare innovation. To achieve this endeavor, the company announced several initiatives:

- **Microsoft Genomics — which is offered through Azure, Microsoft's intelligent cloud platform — provides researchers and clinicians with accelerated, cloud-powered genomic processing services.** The service is being piloted with St. Jude Children's Research Hospital.
- **Microsoft Azure Security and Compliance Blueprint is Microsoft's offering that aims to make it easier for health systems to move their data storages to the cloud.** The HIPAA-compliant service could give Microsoft a leg-up in the race to control the healthcare cloud market.
- **Project Empower MD is an AI-enabled scribe that can listen, record, and transcribe physician-patient interactions and later provide doctors with intelligent consultations and clinical support.** The

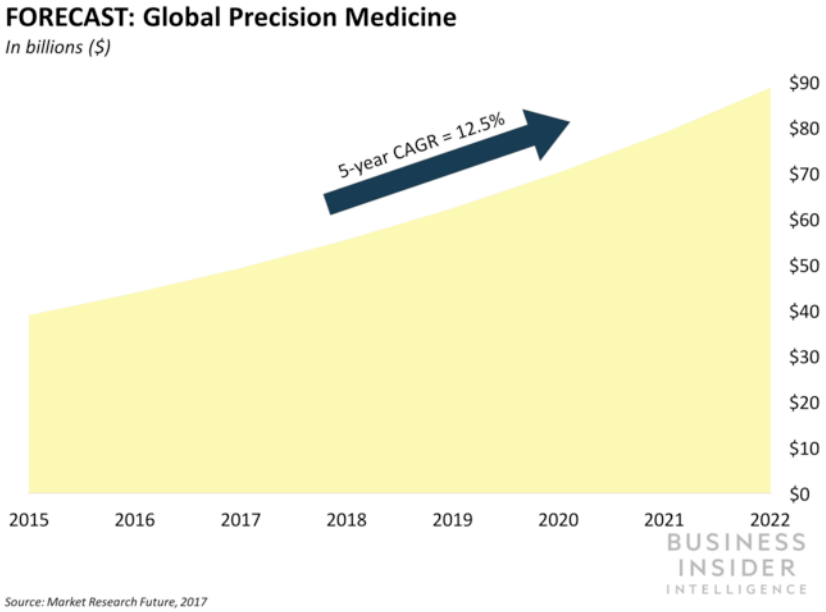
service, which includes an "intelligent scribe," means that doctors can spend less time taking notes or filling in EHRs, and more time with their patients, face-to-face.

Biggest Potential Impacts

Microsoft's clinical genomics and CDS platforms are two particularly interesting offerings that will impact both health systems and insurers equally:

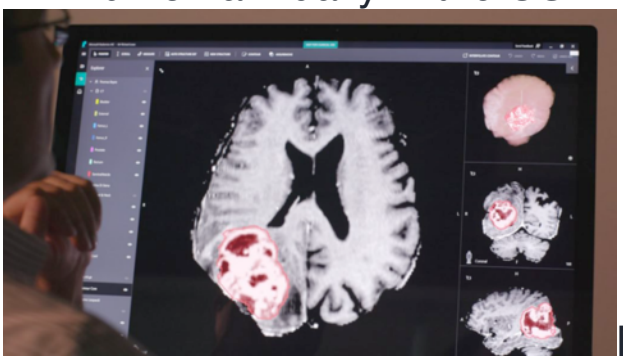
Health Systems

Genomic medicine is an increasingly common tool within the healthcare system as health organizations better understand how to extract the value from patients' genetic data. A growing number of providers are adopting the technology, which is fueling precision medicine, population health, personalized pharmaceuticals, and better chronic illness care. Globally, the clinical genomics market is set to grow at an annualized rate of 17% between 2018 and 2023 to reach $870 million, according to Research and Markets.



- **Insights into patient DNA can help determine the success rate of specific drug therapies for patients and guide treatment.** Optimizing treatment regimens for patients can improve operational workflow efficiency in health systems by speeding up patient turnaround. Genomic testing can help by identifying whether a patient will be receptive to certain medications, while also reducing the risk of adverse drug events, which cost the healthcare market $136

billion annually in the US.



Meanwhile, Microsoft's CDS offerings, such as computer vision technology built into the Azure platform, could pay vast dividends for health systems and insurers alike by increasing the accuracy of physicians' diagnoses. This can result in the earlier prescription of treatment and the reduction of more unnecessary tests.

- Microsoft's Project InnerEye is an example of how the company's machine learning techniques can help oncologists measure tumors in 3D radiological images. This information enables physicians to personalize treatment plans for cancer patients based on the size and progression of the disease.

Health Insurers

The growing adoption of value-based care (VBC), or outcome-based care, by insurers is encouraging the use of preemptive measures to increase a customer's lifetime value. As more evidence of the clinical effectiveness of genetic testing comes to light, payers are becoming more inclined to reimburse providers for using the procedure under the VBC umbrella, Health IT Analytics notes.

- **Early disease identification and detection lowers healthcare costs for payers.** The average cost to payers per patient in the year following diagnoses of breast cancer is about $61,000 for stage 0, compared to $135,000 for stage IV, a study shows. Meanwhile, improving early detection could help control the 86% of US healthcare expenditures allocated to chronic health conditions.

Barriers To Big Tech Companies' Dominance In Healthcare

Although tech companies are forging ahead with their efforts to collaborate with healthcare organizations, there are still pockets of resistance that inhibit the adoption of digital health tech.

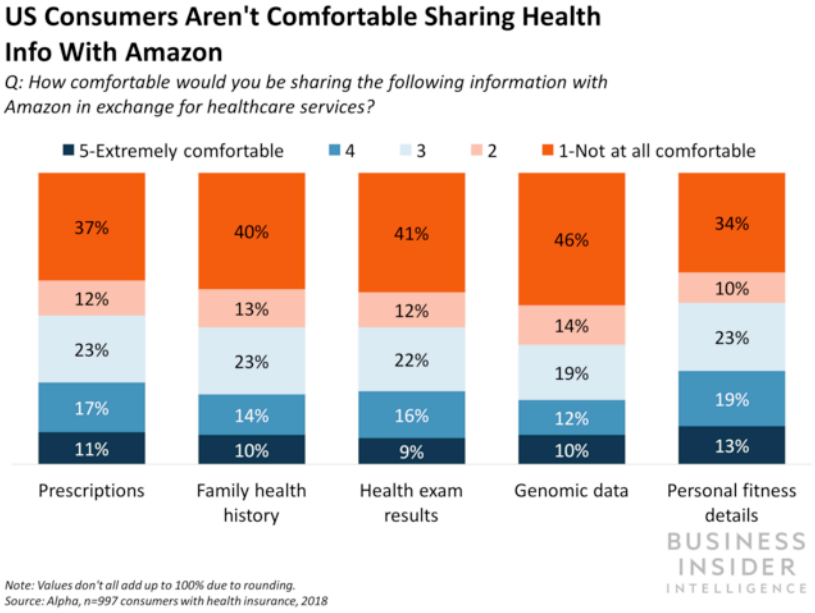
- **We can expect significant pushback from incumbent and legacy**

middlemen. In the instance of Amazon's medical supply delivery efforts, group purchasing organizations (GPO) have a strong grip on the supply market. These organizations negotiate agreements on behalf of multiple hospitals, and hospitals often own a stake in these groups. Navigating longstanding relationships between health systems and supply chain groups is likely to present significant hurdles that must be overcome to make any meaningful headway in the healthcare industry. Using Amazon's foray into the medical supply market again, providers have much more rigid expectations than Amazon's retail consumer audience. Accuracy, stock, and timely delivery are nonnegotiable for health systems, and hospitals would need contractual assurances before committing to Amazon or any other nonmedical tech company entrant.

- **Physicians' resistance to change is stymying adoption of new health tech.** Healthcare providers are one of the key players in driving change within the healthcare industry. However, it's well known that resistance to change is an inhibitorto the transformation of healthcare. To appeal to physicians and care providers, tech companies are working to provide evidence that their services can increase doctors' time spent with patients. A primary aim of Microsoft's Healthcare NExT program, for example, is to reduce the burden of inputting EHRs for physicians, while Google's Cloud for Healthcare platform seeks to make it easier for physicians to pull insights from patient data stored in the cloud to enhance clinical decision-making.
- **The increasing frequency of cyberattacks in healthcare is demonstrating the vulnerability of patient and health organization data..** Data breaches are a huge cause of concern for healthcare organizations. More than 95% of critical care hospitals and over 92% of regular hospitals in the US have implemented EHR systems, according to Definitive Health, making them increasingly vulnerable to cyberattacks. Besides putting patient data at risk, data breaches can also be a significant financial burden on medical providers. In early January, Hancock Health Hospital paid ransomware attackers the equivalent of $55,000 to recover their systems, according to CSO. And these concerns will only increase as

more health data goes online, dampening tech companies' potential value to healthcare systems. More than 1 million patient records were made vulnerable in 110 US healthcare breaches in Q1 2018 alone, according to the Protenus Breach Barometer.

- **While consumer interest in tech giants' health moves has been piqued, trust lags.** Despite growing interest in tech companies' healthcare offerings, they still have a long way to go to convince consumers to use their platforms. This distrust is best demonstrated by a 2018 Alpha survey, which had US respondents rank tech giants by consumer trust. Amazon was ranked most trustworthy by 36% of consumers, with Microsoft second (21%), followed by Google (20%), and Apple (16%). Facebook lagged far behind with 6%. Despite Amazon's substantial lead in consumer trust over the other tech giants, when it comes to healthcare, consumers are resistant to the idea of using and sharing their health data with the platform.



The disparity between overall consumer trust of tech companies and consumer willingness to use their health services is likely because, for most, health data is still the domain of physicians and healthcare providers who have fostered trust over vast quantities of time. The tech industry will need to focus on building trust and relationships with consumers — and demonstrate its ability to keep health data secure — if it hopes to tap into the market in a meaningful way.

BOTTOM LINE

- Health organizations are increasingly turning to tech companies to transform the way they access and deliver care.
- Health organizations can further tap into this opportunity to collaborate with tech giants to realize cost savings and bolster their top lines.
- The Big Four tech companies are accelerating this shift by developing and collaborating on new tools for consumers, physicians, and insurers.
    - Alphabet is focused on leveraging its dominance in data storage and analytics to become the leader in population health.
    - Amazon is leaning on its experience as a distribution platform for medical supplies, and developing its AI-assistant Alexa as an in-home health concierge.
    - Apple is actively striving to turn its consumer products into patient health hubs.
    - Microsoft is focusing on cloud storage and analytics to tap into precision medicine.

But barriers exist that could impede tech companies' increasingly oversized role in healthcare.