Hype Cycle for Healthcare Data, Analytics and AI, 2023

Published 24 July 2023 - ID G00788390 - 119 min read

By Analyst(s): Jeff Cribbs

Initiatives: Healthcare and Life Science Digital Transformation and Innovation

> This Hype Cycle tracks the emerging technologies that will have the greatest impact on data, analytics and AI initiatives in the payer, provider and life science sectors. CIOs can use this critical insight to guide their strategic planning decisions.

More on This Topic

This is part of an in-depth collection of research. See the collection:

- 2023 Hype Cycles: Deglobalization, AI at the Cusp and Operational Sustainability

Analysis

What You Need to Know

Healthcare and life science data and analytics (HCLS D&A) leaders are ascendant in their strategic influence on healthcare organizations. This influence is due to primacy of insights as a competitive business advantage and is expressed primarily in five areas:

- Creating, maintaining and executing a data and analytics strategy
- Data and analytics governance
- Performance measurement and reporting
- Development of analytics and algorithmic products to improve enterprise performance
- Evaluating and applying a complex set of emerging technologies

The focus of this Hype Cycle is to identify, describe and analyze the technologies that will have the greatest effects on initiatives in these areas. Now, more than ever, it is essential that HCLS D&A leaders forge a vision of focused innovation and material value delivery.

The Hype Cycle

Five key themes emerge from this Hype Cycle.

Large language models (LLMs) appeared suddenly, but transformational value is a long game — The breakout capabilities of large language models in late 2022 and deft marketing by Open.AI and Microsoft propelled it to debut on this Hype Cycle in 2023 already at the Peak of Inflated Expectations. There is tremendous potential for this technology and numerous opportunities for tactical near-term value. However, the transformative use cases that will require the highest levels of safety and ethical development are likely five or more years away from mainstream adoption. This is discussed within individual profiles across the 10 HCLS Hype Cycles. However, we summarized our findings across sectors and use cases in this emerging technology profile:

- Large language models

Narrow artificial intelligence (AI) is shifting to execution at scale — The hype around generative AI casts something of a shadow over the "narrow" (or supervised learning models, generally speaking) AI use cases that have been painstakingly developed for over a decade. But for HCLS organizations with more than five years of data science, D&A leaders are looking beyond innovation pilots and sandbox environments and seeking technologies and practices to deliver and demonstrate AI value at scale. Emerging technologies include:

- AI engineering
- Data storytelling
- Lakehouse
- Advanced analytics architecture for payers
- Advanced analytics architecture for providers

Emerging technologies are changing the economics of healthcare data sharing — HCLS D&A are taking a new look at the value propositions, practices and technologies in data sharing. Emerging technologies include:

- Data sharing

- Data monetization
- Synthetic data
- Federated machine learning
- Health data curation and enrichment
- Healthcare analytics on fast healthcare interoperability resources (FHIR)

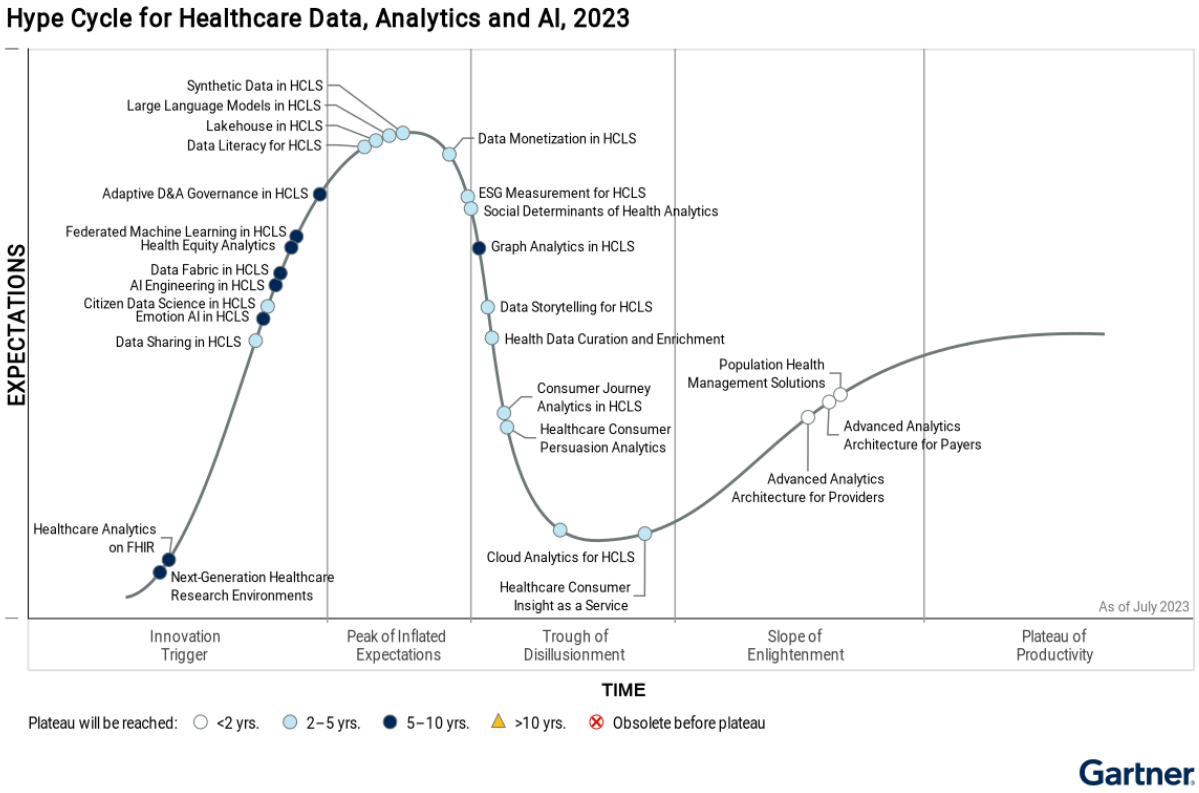
Healthcare data and analytics is at the crux of multistakeholder value propositions — HCLS D&A leaders have unique positions at the intersection of complex value transactions that take place among internal and external stakeholders of healthcare organizations. Their roles in governance, performance reporting and research often require weighing demands from stakeholders such as patients, employees, regulators, investors and partners. Emerging technologies include:

- Environmental, social and corporate governance (ESG) measurement
- Health equity analytics
- Social determinants of health analytics
- Adaptive D&A governance
- Healthcare data literacy
- Citizen data science
- Next-generation research environments
- Population health management solutions

Signals favor a larger role for the hyperscalers — It has been clear for several years that the analytics techniques, architectures and consumer analytics capabilities of the hyperscalers were a distinct advantage to HCLS organizations, relative to what was feasible in their data centers. For several years, hyperscalers have incrementally built out their HCLS industry cloud capabilities, hoping to reach a minimum level of HCLS-specific capabilities required to attract and retain the lucrative cloud services business from HCLS organizations. The hype around LLMs in 2023, including the willingness to pay on a transaction basis (cents per 1,000 tokens) for AI/ML services is a breakthrough for this consumption model in HCLS. Emerging technologies include:

- Cloud analytics
- Data fabric
- Graph analytics
- Emotion AI
- Healthcare consumer journey analytics
- Healthcare consumer insights as a service
- Healthcare consumer persuasion analytics

Figure 1: Hype Cycle for Healthcare Data, Analytics and AI, 2023



The Priority Matrix

The Priority Matrix is a summary companion to the Hype Cycle figure. Using data from the benefit rating and time-to-plateau values for each technology, it plots the answers to two key questions:

- How much value could your organization expect to realize from the effective implementation of a particular technology?
- When will the technology be mature enough to help deliver that value?

Quickly maturing, high-importance transformational technologies are up and to the left of the Priority Matrix. Below them are technologies that are still important, but with a lesser scope of potential impact. On the right, you will find emerging technologies with great potential that are further away from their full maturity. Technologies with lower benefit ratings and longer times to value are listed in the Priority Matrix's lower-right sections.

This analysis reveals that investment in data fabric architecture can be a midterm, transformational investment for many healthcare organizations. Some of the individual components of data fabric, which are also presented on the matrix, such as health data curation and enrichment, cloud analytics, graph analytics, and adaptive D&A governance, are more mature, and present less project risk when implemented individually. However, they will not realize their full value until they are combined in data fabric architecture.

Population health management and social determinants of health analytics are mature investment areas for a majority of healthcare organizations with value-based financial models.

Table 1: Priority Matrix for Healthcare Data, Analytics and AI, 2023

(Enlarged table in Appendix)

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational		Large Language Models in HCLS	Data Fabric in HCLS Emotion AI in HCLS	
High	Advanced Analytics Architecture for Payers Advanced Analytics Architecture for Providers Population Health Management Solutions	Consumer Journey Analytics in HCLS Data Literacy for HCLS Data Sharing in HCLS ESG Measurement for HCLS Healthcare Consumer Persuasion Analytics Health Data Curation and Enrichment Social Determinants of Health Analytics Synthetic Data in HCLS	Adaptive D&A Governance in HCLS AI Engineering in HCLS Federated Machine Learning in HCLS Healthcare Analytics on FHIR Health Equity Analytics Next-Generation Healthcare Research Environments	
Moderate		Citizen Data Science in HCLS Cloud Analytics for HCLS Data Monetization in HCLS Data Storytelling for HCLS Healthcare Consumer Insight as a Service Lakehouse in HCLS	Graph Analytics in HCLS	
Low				

Source: Gartner (July 2023)

Off the Hype Cycle

This year, one innovation, AI strategy, graduated the Hype Cycle, having reached mainstream adoption.

On the Rise

Healthcare Analytics on FHIR

Analysis By: Laura Craft

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

Healthcare Analytics on FHIR are new analytic value propositions enabled by the advancement of the Fast Healthcare Interoperability Resources. FHIR standards and the FHIR Bulk Data Access API allow the easy extraction of clinical data and large volumes of population level data. This data can be used for a variety of analytic use cases across healthcare, research and public health domains from reporting HEDIS measures to improved public health surveillance.

Why This Is Important

The integration and aggregation of healthcare data is not an easy task. It is often accomplished with proprietary and highly engineered data pipelines that can impede the ability to conduct analytics in an expedited and effective manner. FHIR standards and the bulk transfer protocol offer the promise of simplifying the complexities of having access to large amounts of timely, comprehensive, high-quality population-level data for advanced insights across clinical care, research and public health.

Business Impact

Healthcare analytics on FHIR will:

- Simplify clinical and claims data integration
- Provide payers and providers with timely visibility into the health status of populations for managing risk, closing gaps in care and reporting on quality measures
- Give researchers easier access to large anonymized datasets for mining, discovery and collaboration
- Simplify and automate disease registry submissions

- Offer public health agencies population-level data for public health surveillance and disease reporting

Drivers

While broad-scale industry adoption is likely still several years away, there are some signals that the use of FHIR standards and the FHIR bulk data transfer for facilitating deeper analytics is getting attention and gaining momentum:

- Advancements in regulatory requirements are driving more consistent implementations and better vendor support. An increasing number of healthcare application vendors are adopting FHIR standards and exposing the FHIR databases to support analytics.
- There are a growing number of implementations of the bulk data transfer capability. These include those by open-source FHIR servers such as Microsoft and hapi, commercial FHIR servers such as Firely Server and CareEvolution, as well as EHR vendors like Epic and Cerner. They improve upon: existing capabilities to integrate disparate EHR data and support population health analytics; automation of quality reporting and HEDIS measures; and other use cases across research and public health.
- As of December 2022, ONC's Cures Act Final Rule added a new certification criterion to the ONC Health IT Certification Program for patient and population services. It represented the culmination of several years of work to enable more timely and efficient access to large sets of health data. The criterion requires developers to build capabilities for standardized export of large quantities of health information according to the Bulk Data Implementation Guidelines.
- CMS has several pilots underway to use the FHIR Bulk Data Access API to deliver large sets of Medicare fee-for-service claims data. These include the Beneficiary Claims Data pilot, the Data at the Point of Care pilot and the claims to Part D sponsors pilot. This will help providers have a more complete picture of patients at the point of care and support population-level analytics.

Obstacles

- The healthcare industry moves very slowly and tends to adopt standards only as they are regulated and mandated. Coupled with the industry's resistance to data sharing, widespread adoption could be limited.

- There are basic challenges with FHIR architecture that affect the ability to use FHIR data for analytics. FHIR is a complex standard. It is made up of a number of terminologies, resources and data models that can be difficult to understand and might not be in the format needed for analysis.
- The FHIR standard — and the underlying technical, vocabulary and content alignment — is evolving far faster than the traditional systems for data ingestion and use.
- The FHIR resources and implementation guides that have been approved through the HL7 balloting process currently represent a limited set of data

Analyst Notes:

We position Healthcare Analytics on FHIR right at the Innovation Trigger as solutions have just begun to materialize. We will be watching early adoption of the new FHIR regulations closely to see the extent to which end users make strategic use of the capability. Interoperability and data platform vendors are beginning to build out FHIR analytic capabilities. We will watch to see how this evolves. It is possible there could be rapid acceleration in adoption, on the near end of five to 10 years.

User Recommendations

Develop your Healthcare Analytics on FHIR strategy:

- Identify your use cases for more timely access to population level clinical and claims data.
- Become familiar with FHIR standards, the bulk data transfer capability and the enabling technology pipeline.
- Understand how your EHR and/or cloud analytics platform vendor is supporting integration of clinical and claims data using FHIR-based standards for analytics, and evaluate how this fits with your existing D&A capabilities.
- Look at vendors in the market who have solutions and are supporting analytic use cases.

Track industry adoption and application of Healthcare Analytics on FHIR. You can track development of the standards at:

- HL7.FHIR.UV.BULKDATA\Bulk Data Export - FHIR v4.0.1
- 170.315(g)(10) Standardized API for Patient and Population Services
- HL7 FHIR API Criterion - 170.315(g)(10) - ONC Health IT Certification Program API Resource Guide

Sample Vendors

1UpHealth; AWS; Google Health Cloud; InterSystems; Microsoft; Mphasis; Smile Digital Health

Next-Generation Healthcare Research Environments

Analysis By: Jeff Cribbs, Reuben Harwood, Jeff Smith, Laura Craft

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Definition:

Next-generation healthcare research environments are a collection of capabilities required to address the evolving needs of research institutions. These include differential user access, data and algorithmic marketplaces, standards-based ontologies, data enrichment, hybrid cloud, MLOps and collaboration tools. It applies the principles of composable business to deliver these capabilities, from foundational to translational stages, though the architecture is not yet clearly defined.

Why This Is Important

Sustaining a competitive edge in medical and scientific research is a critical component of the research mission of many large healthcare providers and academic medical centers. Researchers need the ability to analyze a broad range of data sources to develop hypotheses, test them rigorously, publish findings and translate findings into practice. All of these activities must be executed under some of the most rigorous and complex governance standards across industries.

Business Impact

Next-Generation Research Environments will help research organizations:

- Conduct more innovative research
- Deliver a higher volume of studies and associated publications
- Attract and retain top research talent and medical students
- Compete for grant funding
- Reduce the time and effort in governing and delivering data access to researchers
- Translate research findings into healthcare delivery and management operations

Drivers

- Frustrations among researchers who need access to data for research. These researchers widely report onerous processes, lengthy wait times and low quality delivery data access.
- Maturity of core technologies in data standards, machine learning, synthetic data, federated machine learning, cloud analytics and AI engineering.
- Maturity of research methodologies and their instantiation in technology. For example, patient similarity algorithms, Monte Carlo simulation for population health interventions or automated outcomes labeling for ML training.
- A blurring of lines between heritage categories of research work, including drug discovery, randomized controlled trials, observational studies, population health, public health and policy (including sustainability and health equity), health economics, comparative effectiveness, financial operations, digital health and citizen data science.
- Demand for greater collaboration across clinical specialties, data domains (i.e., digital health, genomics, cell and gene therapy), social and environmental determinants of health, and across organizations.
- Growing prominence of translational medicine practices to take the “laboratory bench, to the bedside, to the community.”
- Increasing complexity of medical ethics, privacy, security and governance introduced by the drivers above.

Obstacles

- Financial incentives for both individual researchers, governance and regulatory stakeholders and institutions often favor conducting research in silos, on known data, using established techniques and processes.
- Uncertainty about the future economics, regulation and technology architecture of data sharing for research.
- Design of an effective Gen 2 environment will require a thorough understanding of a diverse set of emerging technologies and the interplay between them, a complicated and rapidly changing business environment and an eccentric set of users.
- A perception among leadership that in anticipation of changes in regulation, governance practices or institutional strategy, it is best to wait for "final requirements."
- The complexity and expense of these environments will make implementation challenging. It will require organizations to segment deliverables that create incremental value in close time horizons.

Analyst Notes: Generation 2 research environments exist largely in the vision documents of high-prestige academic medical centers. We advance adoption of this profile marginally this year, but expect that there will be substantial clarification of the requirements and more robust vendor solutions in the next two years. Mainstream adoption is likely to be 5 to 7 years away. No vendor sells a product that satisfies this entire scope of capabilities, but representative vendors demonstrate various important components.

User Recommendations

- Assess the current state of your research data environment against the five-year research ambitions of your organization. Document and quantify, where possible, the costs, frustrations, inadequacies and missed opportunities now, and how they will change (likely grow) in the emerging era of medical research.
- Educate business, clinical and research peers on the virtues of the emerging technologies utilized in Gen 2 research architecture to address organizational gaps in capability.
- Organizations ready to invest today should procure consulting services that can bring both research domain expertise and cross-industry technology experience to build a target architecture and implementation timeline for a Generation 2 research environment.

Innovation in Practice:

- The Broad Institute in Boston convenes talent, technology and data from leading academic research organizations and healthcare delivery organizations to accelerate research in diverse categories (from genomics to data science) and under a variety of funding models.
- The National Healthcare Group in Singapore brings “real world research” to a spectrum of practical healthcare and population health needs from in-hospital robotics to tissue banking.

Sample Vendors

BC Platforms; dātma; Google Cloud; Ledidi; Lifebit; Mayo Clinic Platform; nference; OmniTier; Velsera

Gartner Recommended Reading

Healthcare and Life Science CIO’s Genomics Series: Part 1 — Understanding the Business Value of Omics Data

Creating the Composable Healthcare Organization for Healthcare and Life Science CIOs

Healthcare and Life Science Business Driver: Medical Technology Innovation

Data Sharing in HCLS

Analysis By: Laura Craft

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Data sharing in healthcare and life science (HCLS) reflects a broad range of use cases that knit together ecosystem partners to advance clinical care, research and discovery; improve public health; decrease health disparities; and lower costs. Data sharing in HCLS relies on a foundation of interoperability, privacy protecting policies and standards to enable the industry to safely and collaboratively drive new value streams through better data sharing partnerships.

Why This Is Important

It is increasingly clear that the rate-limiting factor in the advancement of medical science is access to data. Data sharing is an essential business capability, and is critical for aggregating diverse data sources and developing predictive models for large-scale biosurveillance and vaccine development. Also, population health policy research requires data sharing beyond the healthcare industry. Organizing and advancing data sharing is vital to individual, societal and global public health.

Business Impact

Data sharing impacts the business by:

- Better positioning organizations to compete in an industry experiencing extreme fiscal pressures, supply chain shortage, workforce burnout and the “co-opetition” with nontraditional players such as the digital giants and retailers.
- Improving organizational readiness to respond to data sharing mandates and, in some cases, help avoid compliance penalties.
- Supporting research and collaboration.
- Enabling composability and improving accuracy of new models.

Drivers

- Healthcare's digital transformation is creating new value streams that are reliant on a foundation of agile data exchange and sharing. These include digital care navigation, medical shopping, collaborative clinical research, expedited drug development, consumer technology integration, integrated health and social care.
- Healthcare and life science CEOs' interest in data monetization is increasing with the rise of health data consortiums, commercial health data platforms and the emergence of enabling technologies such as privacy-enhancing computation and synthetic data.
- Health data marketplaces for HCLS, like Amazon Web Services (AWS) Data Exchange, HealthVerity and Snowflake Marketplace, and new data management techniques, such as the data fabric, are making the task of sharing data easier, more achievable and affordable.
- A growing number of state and national government rules, proposals and initiatives are mandating interoperability standards for certain functions across providers, patients and payers. The proposed Electronic Prior Authorization rule by Centers for Medicare & Medicaid Services (CMS) even includes an associated penalty for providers who are noncompliant.
- Adopting and implementing interoperability standards is much easier with the introduction of frameworks like the Trusted Exchange Framework and Common Agreement and projects like Da Vinci, Gravity and Argonaut by Health Level Seven International (HL7). These frameworks and projects provide policy and technical approach guidance.

Obstacles

- Data sharing is difficult. Even with the best of standards and new capabilities, it requires a complex architecture and set of governance policies, guidelines and guardrails that is challenging for healthcare organizations to manage.
- Privacy and patient consent concerns will always be top of mind — and a primary target of regulation such as the Health Insurance Portability and Accountability Act (HIPAA) — when it comes to healthcare data. High-profile data breaches exacerbate this obstacle. Patients and consumers need to be confident health organizations are good stewards of their data — which comes with its own set of complexities.
- There is often an internal culture of resistance for sharing data and outdated perceptions that alleged risks of data misuse outweigh the business benefits of sharing data.
- Business model misalignment and lack of financial incentives for sharing data curtail interest and participation in data sharing collaboratives.
- Despite great strides by payers, providers, LS orgs and government regulators to reduce data exchange friction across the industry, healthcare data is extremely complex. The healthcare industry continues to trudge along at an exceedingly slow pace compared to other industries basically due to laziness and lack of attention to and investment in enterprise strategies to support this.

Analyst Notes:

We position data sharing in HCLS between the Innovation Trigger and the Peak of Inflated Expectations as there is growing demand and urgency for healthcare organizations to embrace good data sharing habits, meet regulatory mandates and contribute to data collaboratives. Moreover, there are a growing number of opportunities to participate, such as the global Health Data Collaborative, the Yale University Open Data Access (YODA) Project, Sanford Health and Sanford Data Collaborative (by DataCollaboratives.org), to name a few.

User Recommendations

- Develop a data sharing strategy that is grounded in a firm understanding of who your ecosystem partners are (or could be), what they offer you and what they need from you. Take an outside-in look at new value streams that can be created through new partnerships.
- Evaluate your data governance models and make sure your approach to govern data covers both internal and external data sharing relationships. The right governance model needs to protect the integrity of the assets. Include patient consent and privacy rigor as part of governance.
- Assess feasibility of using synthetic data for research and enable an environment where researchers can participate in federated machine learning collaboratives and consortiums.
- Think about adding a data sharing product owner to the team to demonstrate organization commitment to make sure data sharing becomes a core organizational competency.

Sample Vendors

Amazon Web Services Data Exchange; Google; HealthVerity; Mayo Clinic Platform; TripleBlind; Truveta

Gartner Recommended Reading

How CDAOs Need to Prioritize Data Sharing Investments for Digital Business Success

Why Data Sharing Is Important: Introducing Gartner's 'Must Share' Model

Data and Analytics Essentials: Data Sharing

Citizen Data Science in HCLS

Analysis By: Jeff Cribbs, Carlie Idoine, Shubhangi Vashisth, Amanda Dall'Occhio, Rita Sallam

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Citizen data science offers a collective set of advanced analytic capabilities to individuals within the organization, who are not data and analytics (D&A) experts, to deliver analytic insights. A citizen data scientist is a persona or group of roles with the same concerns and goals. In healthcare and life science (HCLS), these individuals may be situated in various departments, including clinical, financial, supply chain, research and operations.

Why This Is Important

Citizen data scientists are important since:

- They reduce the talent gap due to the shortage and high cost of data scientists — a key challenge in HCLS organization.
- Their creation and delivery of insights add to the power, impact and accessibility of the organization's D&A discipline.
- Their functional knowledge adds dimensions of efficiency, efficacy and depth to the organization's solutions and experience. They often unlock new insights beyond basic descriptive and diagnostic capabilities.

Business Impact

The most powerful business benefits are realized when citizen data scientists are actively recruited in fusion teams, provided tools, and perform specific tasks in the analytics life cycle (such as feature and algorithm selection) to best leverage their expertise. Ultimately, this puts the power of the tooling in the hands of those that know best how to apply and align it to making business decisions.

Innovation in Practice:

- Case Study: A Culture of Data Literacy and Data-Driven Decision Making (Froedtert & the Medical College of Wisconsin)

Drivers

- **Talent gap —** The sheer volume of personnel needed continues to outstrip demand. Citizen data scientists help fill a portion of that gap. Historically, building data science and machine learning (DSML) models required expert data scientists who are difficult and expensive to hire and retain. Citizen data science helps ease such limitations.
- **Functional knowledge —** Citizen data scientists' primary knowledge base is an in-depth understanding of the business domain. It is the combination of functional knowledge, data science skills and technology that drives results.
- **Vendor offerings —** Vendors have recognized this additional population as a target-rich environment for their offerings. As such, tools and features designed specifically for use by citizen data scientists are now prevalent in many vendor offerings.
- **Augmented analytics capabilities —** These include automated, streamlined data access and data engineering; augmented user insight through automated data visualization and exploration; modeling and pattern detection, including feature engineering, model selection and validation; automated deployment and operationalization; and capabilities to support collaboration and sharing.

Obstacles

- Like all federated organizational models in D&A, citizen data science can create governance challenges for D&A leaders as distributed users find new and creative ways to perform analysis and interpret usage guidelines.
- Most current tools with augmented analytics capabilities lack support for additional processes to manage creation and sharing of models across the organization.
- There is still a need to (statistically) validate the results of citizen data science by expert data scientists. This somewhat dampens the overall value proposition (preserving scarce and expensive data science talent) in the near term.
- Expert data scientists often resist or underestimate the effectiveness of citizen data science approaches.
- Citizen data science is often deemed to be just a preliminary, elementary step and not a fully functional DSML approach.
- Citizen data science leveraged in silos, with no oversight or collaboration among experts and others with a vested interest in DSML success, could lead to duplication of data engineering and analytic efforts, lack of operationalization, and limited visibility and standards.

Analyst Notes: We advance this profile minimally, as most healthcare organizations continue to resist deploying data science capabilities to nontechnical users. We predict mainstream adoption on the high end of two to five years. The longevity of this profile in its current form faces some new uncertainty, as generative AI looks poised to substantially lower barriers to R and Python coding that underpin the business value of this capability.

User Recommendations

- Educate business leaders and decision makers about the potential impact of a broader range and larger pool of delivery capability. Work with leadership to scan opportunities for citizen data science to complement existing analytics and expert data science initiatives.
- Create communities of practice and provide training and tools to develop an inviting and supportive environment for all to explore the value of the citizen data scientist persona. This involves defining the citizen data scientist as a formal persona.
- Challenge and engage your most sophisticated and curious analytics users with a progression opportunity to the role of citizen data scientist.
- Ensure governance processes that make appropriate use of specialist data scientists to validate and operationalize models, findings and applications.
- Provision augmented analytic tools (including, but not limited to, augmented data science and machine learning tools), platforms, and processes to support and encourage collaboration among business users, application developers and data science teams.

Sample Vendors

Aible; Alteryx; Axtria; Clearsense; DataRobot; dotData; H2O.ai; Qlik; SAS; SparkBeyond

Gartner Recommended Reading

Build a Comprehensive Ecosystem for Citizen Data Scientists to Drive Impactful Analytics

Maximize the Value of Your Data Science Efforts by Empowering Citizen Data Scientists

Emotion AI in HCLS

Analysis By: Laura Craft

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Definition:

Emotion artificial intelligence (AI) technologies (also called affective computing) use AI techniques to analyze the emotional state of a user via computer vision, audio/voice input, sensors and/or software logic. It can initiate responses by performing specific, personalized actions to fit the healthcare consumer's mood or sense the patient's emotional state and needs.

Why This Is Important

Healthcare and life science organizations must build empathy with consumers — such as patients, members and providers — to create trusted, personalized interactions and relationships. Current data and analytics technologies do not allow for easy collection and coding of the feelings, wants, needs, beliefs and preferences that underlie empathetic engagement. Emotion AI bridges that gap. It allows human-machine interfaces to detect and respond to sentiments in different contexts.

Business Impact

Improve patient engagement, satisfaction and outcomes throughout broad use cases such as:

- Improved understanding of emotional reactions to treatments
- Assisting in the diagnosis of mental illness
- Supporting autonomous living of the elderly
- Triaging patients in a waiting room by detecting and responding to their pain and discomfort levels
- Real-time analysis of voice conversations and emotion detection in contact centers
- Enhanced empathy and emotional responses from automated consumer and patient facing tools

Drivers

- As more healthcare and life sciences (HCLS) organizations are competing on consumer experience, they will leverage emotion AI to improve organizational and product empathy that addresses the feelings, wants, needs, beliefs and preferences of consumers.
- The strongest adoption of emotion AI is Improving operational efficiencies in contact centers. Voice-based emotion analysis is supporting multiple use cases such as real-time analysis of voice conversations, emotion detection in chat conversations and emotional chatbots.
- HCLS organizations require data on emotions and emotional states for the system to act more empathetically. This is particularly important as vendors incorporate advanced capabilities like generative AI to improve workflows and engagement.
- Emotional responses and empathy are a critical element in consumer/patient adoption and use of virtual health assistants/avatars.
- As the metaverse unfolds, virtual beings will play an important role in evolving business models — and the entire ecosystem of this new digital world — and will require the ability to understand human emotions and convey empathy.
- Generative AI, such as large language models like ChatGPT, are being embedded into consumer-facing technologies and stand to support increased adoption of emotion AI.
- Clinical burnout is one of the biggest industry pain points. Emotion AI has the potential to help reduce clinician burnout by assisting clinicians in understanding patients' behavioral responses more precisely and improving clinician/patient interactions.

Obstacles

- Privacy concerns are the main obstacle to rapid adoption. Healthcare consumers may not be comfortable having their emotions monitored in a private home environment via listening devices like virtual assistants. Research environments, such as product testing, have the advantage that the emotion AI is used for this specific purpose and users (product testers) are fully aware their emotions are being captured to improve usability or other features.
- Bias and model accuracy is a concern, especially when using facial expression analysis. Models must be trained in a range of geographies to detect the differing nuances present due to different cultural backgrounds.
- Consistency across modalities is variable. Certain emotions can be better detected with one technology mode than with another. For instance, “irony” can be detected using voice-based analysis, while this is close to impossible to detect with facial expression analysis.
- Identifying and processing human emotion is currently a gray area, especially in the EU. The EU Commission has started an initiative to review the ethical aspects of AI technologies, and emotion AI will certainly be part of this debate.

Analyst Notes:

This technology advances slightly this year to the midpoint between Innovation Trigger and Peak Hype. There is still considerable time to maturity. We rate this technology for its ability to improve experience and engagement.

Example of vendors demonstrating the use of emotion AI:

- Twill is using emotion AI in mental healthcare to learn about one’s health needs and personalize care.
- LUCID uses an AI recommendation system to suggest music based on the patients’ mental state.

User Recommendations

- Review a vendor's capabilities and reference cases carefully in the selection process. As the market is immature, most vendors are focused on two or three use cases in narrow specialties or market segments.
- Partner with your clinical, business and operational leaders to assess and prioritize the potential use cases and inform vendor selection.
- Appoint responsibility for data privacy in your organization — a chief data privacy officer or equivalent.
- Work with your vendor on change management to avoid user backlash due to sensitive data being collected.

Sample Vendors

Affectiva; Authenticx; Behavioral Signals; Cogito; Intelligent Voice; Opsis; Sensely; Sensi.ai; Symanto; Uniphore

Gartner Recommended Reading

Competitive Landscape: Emotion AI Technologies

Emerging Technologies: Emotion AI in the Workplace

Competitive Landscape: Customer Analytics

Tool: Vendor Identification for Natural Language Technologies

Healthcare and Life Science Business Driver: Total Experience Transformation

AI Engineering in HCLS

Analysis By: Jeff Cribbs

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Definition:

AI engineering is foundational for healthcare and life sciences (HCLS) enterprise delivery of AI solutions at scale. The discipline unifies DataOps, MLOps and DevOps pipelines to create coherent enterprise development, delivery (hybrid, edge), and operational (streaming, batch) AI-based systems.

Why This Is Important

In HCLS, AI has been incorporated into business and technology strategy at a breakneck pace, but execution of AI projects has lagged substantially. AI engineering is the crucial discipline for closing this gap by enabling a consistent operational model for delivering value with AI at scale. This importance will grow quickly, as today's scattershot AI pilots proliferate into dozens and eventually hundreds of deployed models with HCLS organizations.

Business Impact

Most forward-leaning HCLS organizations have a handful of well-performing AI models. However, in order to bring each algorithm into operations, many organizations rely on fortuitous alignment of data accessibility, friendly (or avoidable) governance processes and preexisting "hooks" in operational systems where AI can be deployed. With consistent AI engineering pipelines it is possible to readily deploy models into production in a structured, factory-model framework to realize significant value.

Drivers

- HCLS business, clinical and technology leaders consistently rank AI as the emerging technology with transformational potential in the industry. They have invested accordingly in early stage tools and talent.
- AI engineering is the practice that will achieve this potential, making it a critical differentiator for HCLS organizations — whether they are primarily seeking revenue, global prestige or breakthrough opportunities to fulfill their mandate to the public good.
- The number of AI use cases and the scale at which the models need to operate will require more efficient processes to develop, govern and deploy models in production.
- The onerous costs of creating learning datasets, especially for supervised models that require expert labeling, will drive adoption of DataOps.
- There is growing sensitivity to risks associated with algorithmic bias (especially as an amplifier of health inequity), model performance drift, privacy, and medical errors. The ModelOps pipeline of AI engineering can decrease the risk of adverse patient outcomes and experiences and the associated legal liability.
- The process of developing AI models is resource-intensive. ModelOps can enable discoverable, composable and reusable AI artifacts (i.e., data catalogs, feature stores, model stores), accelerating model development.
- There is a recognized need for greater collaboration. AI engineering can operationalize AI architectures by bringing together data engineering, data science, application development, security and platform infrastructure teams.

Obstacles

- AI engineering requires a cultural change. In HCLS, data science talent has often had a removed perch in an innovation center or AI lab. This has allowed a “free wheeling” approach with relatively little governance or accountability that rewarded enterprising engineers to cobble solutions together in Jupyter Notebooks, desktop applications and sandbox environments.
- The shift to AI engineering will require individuals to adhere to common standards and constraints for data, governance and deployment in exchange for a more reliable and efficient path to production. Not all individuals will accept this proposition.
- AI engineering today requires a degree of cloud maturity, coordination of cross-departmental data pipelines and significant changes to existing architecture. These costs may be a deterrent for many organizations.

Analyst Notes: We position this profile relative to the value it will deliver to the HCLS organizations that will ultimately adopt it. By that reference, it is embryonic, at 1-5% of its value but is likely to accelerate quickly, reaching mainstream on the early side of five to 10 years. Representative vendors in this category offer at least one technology component of AI engineering with healthcare-specific features.

User Recommendations

- Advocate for AI engineering among clinical, business and technology leadership as the key practice for delivering value with AI at scale.
- Maximize business value from ongoing AI initiatives by establishing AI engineering practices that streamline the data, model and implementation pipelines in order to standardize AI delivery processes.
- Leverage cloud service provider environments as foundational environments to build AI engineering along with rationalizing your data, analytics and AI portfolios as you migrate to the cloud.
- Look toward upskilling existing data engineering and platform engineering teams in order to adopt tools and processes that drive continuous integration/continuous development (CI/CD) for AI artifacts.

Innovation in Practice:

- Case Study: Driving Speed to Value With AI/ML (Kaiser Permanente)
- Case Study: Make AI Models Credible, Not Explainable (Unity Health Toronto)
- The GSK Artificial Intelligence and Machine Learning team brings their AI Engineering technology and talent (especially their Molecular Disease Characterization Initiative) to their collaboration with King's College London in the Translational Oncology Research Hub. They aim to develop AI-enabled tools to support clinical decision-making and personalize care for patients with cancer.

Sample Vendors

Amazon Web Services; DataRobot; Domino; ForePaaS; Google Cloud Platform; Microsoft; SAS; ClosedLoop.ai

Gartner Recommended Reading

Data Science and Machine Learning Trends You Can't Ignore

Toolkit: Delivery Metrics for DataOps, Self-Service Analytics, ModelOps and MLOps

Healthcare and Life Science Business Driver: Strategic Technology Change

A CTO's Guide to Top Artificial Intelligence Engineering Practices

Data Fabric in HCLS

Analysis By: Gregg Pessin

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

A data fabric is a design framework for attaining flexible, reusable and automated data integration pipelines, services and semantics. It supports a broad spectrum of operational and analytics use cases on various platforms. Data fabric design provides the necessary data access capabilities for the composable healthcare enterprise.

Why This Is Important

Due to uncertainty and constantly changing market conditions, healthcare organizations need to be able to create and recompose business and clinical capabilities more quickly. Composable architecture is the solution to this requirement, and data fabric is the foundation of that architecture. Data fabrics will significantly reduce or eliminate manual data integration tasks and augment (in some cases, completely automate) data integration design and delivery.

Business Impact

Data fabric solves the healthcare industry's data problem. The sector has disparate data sources across care delivery, payer and life science enterprises. These isolated data sources hinder the timely, full-value delivery of enterprise-level information insights. Data fabric improves data access velocity, improving decision making. It offers an opportunity to eliminate manual data integration tasks significantly and automate data integration design and delivery.

Drivers

- The healthcare industry is in the midst of a digital transformation, which at its core requires composable enterprise architectures for success. Data fabric is a crucial enabler of composability. Adoption is low currently, but the hype is creating more interest as the healthcare industry begins to apply composable concepts to their application solution sets.
- Most organizations will find that they already have some of the base components of a data fabric, creating a solid foundation to begin the journey.
- Data science as a practice is maturing in healthcare, motivated by the need to expose more value from data. At the same time, new independent data sources with higher complexity drive the need for better data access solutions.
- Data fabric offers an alternative approach to traditional interoperability requirements. The data integration, interfacing and interoperability issues that plague the industry have another solution option with data fabric.
- New technologies that support the data fabric solution set are becoming generally available, including knowledge graphs, active metadata management and semantics management.

Obstacles

- Healthcare industry organizations lack enough high-quality data to train the machine learning (ML) required to activate metadata and enable a fabric.
- Lack of metadata in the early stages of data management initiatives — especially for on-premises deployments — will put initial pilots at risk of failure.
- Healthcare data returned from data fabric stacks must consider the privacy of the data-owning patient. In gathering the healthcare information, the data fabric technology layers must each comply with local regulations such as Health Insurance Portability and Accountability Act (HIPAA) and General Data Protection Regulation (GDPR).
- In addition to privacy, patient/member/consumer/citizen consent for access to their healthcare data is gaining momentum and shifting in complexity as granular consent gains traction. Data fabric capabilities must include honoring individual consent approvals to the data element level.

User Recommendations

- Assemble a fusion team of D&A practitioners, IT engineers and business users completing significant, manual data preparation for their projects. The CIO will find the right automation opportunities and gather the right team by finding personnel that experience the mundane task involved in delivering value from data.
- Task this newly formed team to identify where the data resources do not meet business or clinical requirements. The team should look for key technology solutions where users find accessing and using the associated data difficult.
- Develop KPIs that align with business outcomes, and capture performance before and after the pilot. Examples include correlating patient length of stay, delays due to an EHR availability outage, payer overpayment due to 30+ days, delay in access to paid claims data, or delayed clinical trial progress due to IT system inefficiencies.

Sample Vendors

Cambridge Semantics; Cinchy; CluedIn; Denodo; IBM; Informatica; Semantic Web Company; Stardog; Talend

Gartner Recommended Reading

Quick Answer: What Is Data Fabric Design?

Federated Machine Learning in HCLS

Analysis By: Laura Craft

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Federated machine learning (ML) in healthcare and life science (HCLS) aims at training an ML algorithm on multiple local datasets contained in local nodes without the explicit sharing of data samples. Federated ML helps to protect privacy, enables ML and specifically deep neural networks (DNNs) to use more data, resolves data transfer bottlenecks and empowers collaborative learning for better accuracy.

Why This Is Important

Federated ML (FedML) allows consortia of healthcare and life science organizations to develop ML algorithms built on collective data assets without the data itself ever leaving the participants' local environments. This dramatically lowers the administrative burden, costs, and legal and reputational risk relative to past initiatives to colocate private data from the organizations. FedML adoption has accelerated recently, spurred in part by successful public health use cases during the pandemic.

Business Impact

For many healthcare and life science (HCLS) AI use cases, a primary barrier to value is the availability of a robust learning dataset. This is especially true in use cases involving low-prevalence clinical scenarios, where any single organization is unlikely to have enough cases to develop a clinically valid algorithm that reaches high-performance levels across a representative patient population. Expanding learning datasets to multiple local training sites can also reduce the risk of bias.

Drivers

- High barriers to data sharing in HCLS. These include legislation, regulation, industry governance processes, and data integration standards and technology. FedML delivers value by circumventing many of these barriers.
- Recent, well-publicized, FedML success stories such as the electronic medical record (EMR) chest X-ray AI model (EXAM) study which was published in Nature Medicine in September 2021. It demonstrated how federated learning in the healthcare domain could be used for predicting outcomes of patients that turned up to the emergency department with respiratory complaints.
- Increased attention on AI governance in healthcare and by public health policymakers, especially as it pertains to ensuring high-performance standards across racial, demographic and geographic patient populations.
- Increased attention on privacy-enhancing technology and AI along with accelerated venture funding for healthcare startups that provide privacy-enhancing FedML capabilities.
- The increasing implementation of edge AI, where the data becomes distributed across multiple, heterogeneous edge medical devices, equipment, ambient sensors and clouds. FedML allows organizations to keep the data in place, while enabling critical analytics use cases like facilities monitoring, home healthcare and remote patient monitoring.
- Standards are emerging to support the adoption of FedML by providing a blueprint for data usage and model building across organizations and devices, while meeting applicable privacy, security and regulatory requirements.

Obstacles

- Enabling FedML requires a complex infrastructure stack. This necessitates a degree of implementation maturity that is beyond most healthcare organizations today.
- Creating a new, more accurate and unbiased central model from local models is a nontrivial task both from a technical and modeling point of view. A central actor will need to make decisions in creating the central model. Participants must trust that their local interests are fairly accounted for in these decisions.
- Building trust and credibility in AI output is already difficult. FedML adds another layer of abstraction to the lineage of the algorithm, adding another reason for skepticism among clinical and business detractors.
- In use cases where FedML is essential to advancing medical science, the best inclinations of the industry are likely to prevail. But in more marginal cases, where organizations compete for revenue or prestige, it will take time to establish compelling value propositions for diverse participants.

Analyst Notes:

FedML was nudged slightly up the Innovation Trigger to right before the Peak of Inflated Expectations. FedML continues to gain traction and momentum as a highly desirable way to safely participate in a variety of data-sharing collaboratives and we see progressive industry adoption.

User Recommendations

- Include FedML and synthetic data as considerations in your organization's data-sharing strategy. Ensure senior leaders are well-versed in the abilities of these technologies to make ecosystem collaboration more feasible. Share examples of HCLS organizations that have already started to realize value.
- Investigate internal use cases for FedML. These will primarily come from event streams that are expensive and onerous to integrate into a central D&A infrastructure. Connected laboratory environments, remote patient monitoring and ambient facility monitoring use cases have high potential.
- Ask your existing vendors where they see their capabilities contributing to the FedML value proposition and workflow.
- Understand how emerging standards and projects are addressing common federated learning challenges around privacy, risk and model disparities.

Sample Vendors

BC Platforms; Devron; Duality; Ederlabs; FedAI; NVIDIA; Owkin; Rhino Health; Tencent; TripleBlind

Gartner Recommended Reading

Data Science and Machine Learning Trends You Can't Ignore

Innovation Insight for Federated Machine Learning

Quick Answer: Why Is Federated Learning Prominent in China?

Health Equity Analytics

Analysis By: Mandi Bishop

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Health equity analytics includes the data, practices, technologies and metrics used to identify, measure and remediate unfair treatment of groups of people by the healthcare system. Unfair treatment can take many forms like burden of access, diagnostic and therapeutic decisions, clinical trial representation, and algorithmic bias. Inequity is well-documented among groups such as those defined by income, sex, gender identity, race, sexual orientation, neurological profile and disease status.

Why This Is Important

Healthcare organizations worldwide are vigorously launching and accelerating health-equity-focused initiatives, announcing new executive positions and enterprise (or government) goals aligned to closing disparities — and many are making progress and performance commitments to stakeholders. Although inequities have always existed, access and outcome disparities during the COVID-19 pandemic drew public attention, creating urgency to establish and apply health equity analytics to close gaps.

Business Impact

- Provides visibility into the breadth and severity of disparities among historically underrepresented people (such as diverse races and ethnicities) and newly recognized classes of underrepresentation (such as rare disease patients).
- Exposes business practices that perpetuate disparities such as clinical trial recruitment methods and payer network adequacy models that do not account for burden of access.
- Helps identify tailored intervention opportunities to close disparities.

Drivers

- Diversity, equity and inclusion (DEI) goals are proliferating in global organizations across industries. Healthcare organizations are expanding these efforts to include health equity attainment for their employees.
- Payers, providers and consortiums are investing in health-equity-related initiatives that apply health equity analytics, and many are reporting positive outcomes from enhanced population health efforts. The United Kingdom's National Health Service (NHS) Long Term Plan used health equity analytics to determine how to direct funds to geographies with high inequalities and use those funds to activate community partnerships to address social determinants of health (SDOH) such as homelessness. UnitedHealth Group's Health Equity Services Program reported an 83% reduction in postpartum care disparities for Black women in Ohio and 42% in Michigan, and a 40% reduction in disparities for rural women in Hawaii through culturally and regionally tailored interventions.
- Regulators are pushing for health equity in areas such as value-based care arrangements and clinical trial inclusion. The U.S. Center for Medicare & Medicaid Innovation (CMMI) recently introduced the Accountable Care Organization (ACO) Realizing Equity, Access, and Community Health (REACH) model that requires participants to develop an equity plan to reduce disparities in care. The U.S. Food and Drug Administration (FDA) issued draft guidance on developing plans to enroll underrepresented racial and ethnic populations in clinical trials. This enhances existing FDA guidance on clinical trial diversity.
- The vendor market for solutions that help identify, predict and ameliorate disparities is emerging. Solution types that contribute these insights include SDOH analytics offerings, advanced population health solutions and synthetic data platforms that eliminate sample and model bias.

Obstacles

- Health equity analytics is complex and requires insights across individual, community and business operations domains. Comprehensive vendor solutions are not yet available. Many patient attributes needed to identify inequities (such as race) are sparse or nonexistent in current datasets. Some require self-identification, which some groups are understandably reluctant to do.
- For many organizations, financial and cultural dynamics favor making symbolic or demonstrative gestures in public relations while meeting minimal thresholds for compliance and otherwise preserving the status quo. The fraught nature of the politics and the potential for accusations and recriminations may make otherwise well-intentioned leaders reluctant to uncover and ill-positioned to effectively address health disparities.

Analyst Notes: Because there are such strong forces driving attention and accelerated investment, this innovation is approaching the Peak of Inflated Expectations. However, the data acquisition and quality challenges will continue to be significant obstacles to refining and scaling health equity analytics in the near- and medium-term future. Hence, we do not expect it to achieve mainstream adoption earlier than the next five to 10 years.

User Recommendations

- Assign a data and analytics resource to health equity analytics. Have them collaborate with DEI, clinical and business leaders to examine organizational goals and prioritize underperforming measures to assess with health equity analytics.
- Evaluate existing analytics solution vendors to determine whether they offer equity-focused insights — for example, segmenting care management program enrollment and participation by demographics.
- Investigate and document business practice details such as how network adequacy decisions are made, available modalities and hours of care delivery for low-acuity services, and spoken and written language fluency in care settings and patient education.
- Assess SDOH analytics solutions and data sources for the availability of insights to enhance understanding of the nonmedical contributors to disparities. Seek those solutions that develop insights at the intersection of population characteristics, such as across geographies and socioeconomic statuses.

Innovation in Practice: Rush Health in Chicago compiled public data to identify a 16-year life expectancy gap between two neighborhoods in the health system's patient catchment area. In response, they focused on their employees (the "First Community") and built a health equity dashboard to track wealth building, job and salary growth, and training opportunities.

Sample Vendors

Lightbeam

Gartner Recommended Reading

What Is the Relationship Between Health Equity and Social Determinants of Health?

Video: How to Measure Health Equity Progress

Innovation Insight for Advancing Population Health With Community Resource Network Management

Use Social Determinants of Health Analytics to Inform Health Equity Strategy

Adaptive D&A Governance in HCLS

Analysis By: Laura Craft

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Adaptive data and analytics (D&A) governance is an organizational capability that enables context-appropriate governance styles and mechanisms to be applied to different D&A scenarios to achieve desired business outcomes. Adaptive governance in healthcare and life science (HCLS) addresses the significant diversity in time sensitivity, risk and complexity in D&A use cases that traditional control-based-only governance struggles to accommodate.

Why This Is Important

As HCLS organizations expand their data assets, access and applications of advanced analytics and AI, they also seek to increase data-sharing capabilities across ecosystems that include partners from outside industries and across borders. To scale these practices and deliver business value at the pace of change, D&A governance must shift from its typical control-oriented approach, which is often unresponsive to business needs and leads to or reinforces data silos.

Business Impact

Healthcare D&A use cases are extraordinarily diverse in their time sensitivity, complexity and operational and ethical risk. An adaptive governance approach is essential to success. Adaptive D&A governance enables application of different governance styles (control, outcome, agility and autonomous) to different D&A scenarios, depending on business context. This approach facilitates better enterprise and ecosystem collaboration, responsiveness to business opportunities and improved resiliency.

Drivers

- Recognition by both D&A and business leaders that increased investment in infrastructure (e.g., D&A platforms) cannot yield the ROI as expected without corresponding improvement in D&A governance practices.
- Organizations maturing in D&A increasingly recognize the key role business and clinical leaders play in driving their governance initiatives. Business demand for greater flexibility, agility, responsiveness and interconnectedness of D&A requires better governance practices than those currently available. This need is leading D&A leaders to explore adaptive D&A governance.
- Increased regulatory mandates, along with new value propositions for sharing data across a growing network of partners, creates new layers of complexity in data management, driving the need for new governance styles.

Obstacles

- Although D&A governance practices are maturing in many organizations, maturity is still lower than in areas such as data management and analytics. Many organizations have effectively outsourced governance to megavendors — allowing this essential enterprise competency to atrophy. Traditional governance takes an IT-oriented, center-out, single-style approach that resembles compliance rather than governance.
- Data literacy is unevenly distributed across roles and tends to concentrate in areas such as informatics, clinical trial research and actuarial studies. Adaptive D&A governance requires broader participation from nontechnical roles, and therefore more pervasive data literacy. Business leaders often fail to understand or accept accountability for the information assets they create or acquire, instead expecting their data office (typically residing in IT) to "sort out their data." When data offices launch governance initiatives, business leaders fail to engage effectively or at all.
- Adaptive data governance cannot be outsourced to a vendor. It is a part of internal governance and culture, and shifting the mindset of years of legacy data governance policies and restrictions means implementation will be tough.

Analyst Notes:

Adaptive D&A is a key competency supporting the implementation and value realization from data fabric technologies. Because of its early-stage adoption and foundational role in advancing composability, adaptive D&A is approaching the Peak of Inflated Expectations, and we expect it will achieve mainstream adoption within five to 10 years.

User Recommendations

- Use a D&A maturity assessment (such as IT Score for Data & Analytics) to assess your readiness to enhance governance capabilities. Don't attempt to establish agility and autonomous governance if the foundations for control- and/or outcome-based governance are missing.
- Test the applicability of advanced governance styles in your environment using a proof of concept (POC) to evaluate the business outcomes and value, emerging risks, technological limitations and cultural barriers to wider adoption.
- Engage executive leadership to discuss the results of the POC and develop a business case and strategic roadmap to establish adaptive D&A governance.
- Establish the control and outcome styles of adaptive governance first. Then evolve to the agile and autonomous styles. Proceed on the basis of minimum governance, focusing on limiting the scope of data, analytics and business processes to those that deliver the greatest business value and organizational outcomes.

Gartner Recommended Reading

Data and Analytics Leaders Must Use Adaptive Governance to Succeed in Digital Business

IT Score for Data & Analytics

At the Peak

Data Literacy for HCLS

Analysis By: Amanda Dall'Occhio, Donna Medeiros

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Data literacy is the ability to read, write and communicate data in context, with an understanding of the data sources and constructs, analytical methods, and techniques applied as well as the use-case application and resulting business value or outcome. In healthcare and life science (HCLS), clinical, business and administrative workers increasingly need at least a foundational level of data literacy to realize organizational outcomes.

Why This Is Important

Data and analytics (D&A) drive every facet of HCLS organizations, from clinical trial design and execution to hospital operations and claims administration — and roles using D&A are expanding. The ability to understand, interpret and act upon data — data literacy — is now foundational. Data literacy helps explain how D&A manifests in use cases; how to identify, access, integrate and manage datasets; and how to describe advanced analytics techniques and enabling AI.

Business Impact

The value of data literacy in HCLS will be proportional to the scope and quality of decisions that are based on data. Use cases are as varied as healthcare D&A itself. Increasing data literacy will enable fusion teams to identify high-value experiences to compose and address pain points for providers, patients and employees. Improving data literacy will also help employees increase consumers' understanding of how to manage their health.

Innovation in Practice:

- Case Study: A Culture of Data Literacy and Data-Driven Decision Making (Froedtert & the Medical College of Wisconsin)

Drivers

- HCLS is awash with data. But, in many use cases, the value-limiting step is the competency of the user in regard to analytic tools. This includes knowing how to use the tools, how to interpret the data and what action to take.
- The role of the D&A function has changed. It is now at the core of an organization's business model and digital platforms.
- Executives can emulate their higher-performing peers by putting much more emphasis, energy and effort into meeting the change management requirements of their D&A strategies.
- Defining what data-driven behaviors are expected, using a "from/to/because" approach, is central to employee development plans. It ensures that creators, consumers and intermediaries have the necessary D&A skills, knowledge and competencies.
- HCLS leaders need to take immediate action to create and sustain data literacy. Quick wins build momentum, but lasting and meaningful change takes time because it requires that people learn new skills and behave in new ways.
- Although data literacy practices are immature, executives are prioritizing its advancement and demonstrating its value with their own initiatives, such as incorporating data visualizations into board of director reports. We position this technology at the Peak of Inflated Expectations and believe it will achieve mainstream adoption within five years.

Obstacles

- Varying definitions of "data literacy" with different stakeholders, from enhanced data visualization skills to fostering curiosity about data more broadly.
- Elusive — or even nonexistent — common data literacy models, frameworks and standards. This is especially challenging in HCLS because there's significant variability in data definitions and use-case application, requiring substantial contextual understanding of how and why certain data is useful.
- Organizational inertia and the protectionist stance of departments, such as informatics and actuarial, that have historically been the sources of insight for the enterprise.

- Particularly in healthcare, a set of data end users/decision makers who have a variety of roles, backgrounds, skill sets and comfort levels with data at the onset.
- Lack of capacity and skilled resources in areas such as storytelling to support data literacy initiatives.
- Limited investment in tools and resources deployed for the primary purpose of advancing data literacy, and addressing cultural and data literacy challenges within strategies and programs.
- A piecemeal approach to training and certification.

Analyst Notes:

Data literacy for HCLS advances slightly on the Hype Cycle for 2023 and into early mainstream adoption. There is evidence of a growing appetite for increasing data literacy in healthcare organizations. However, there isn't significant enough movement in creating focused strategies and training programs in HCLS to advance past the peak and to more mainstream maturity at this time.

User Recommendations

- Create a strong narrative vision of desired business and clinical outcomes, particularly with respect to innovation. Show data literacy's value in improving clinical decision making and quality of care, as well as administrative simplification. Raise awareness through storytelling.
- Work with stakeholders who have enthusiasm and appetite, and who recognize that data literacy is a factor for success.
- Partner with HR and business leaders to identify the level of data literacy, learning goals and outcomes for various job roles and personas. Use data literacy assessments to evaluate current data literacy levels and desire to participate.
- Go beyond vendor product training to focus on people's other role-related skills. Use a mix of training delivery methods (classroom, online, community, on the job) to improve overall learning effectiveness.
- Align training and self-service solutions with a broader data literacy portfolio to meet the data literacy needs of both data consumers and creators.

Sample Vendors

Avado; Coursera; Data To The People; Pluralsight; Skillsoft; The Center of Applied Data Science (CADS); The Data Lodge; Udacity; Udemy

Gartner Recommended Reading

How CDAOs Must Lead Data Literacy and Data-Driven Culture

Drive Business Outcomes by Measuring the Value of Data Literacy

Criteria for Selecting Data Literacy Providers for Enterprises That Want to Be More Data-Driven

Tailored Engagement Approaches to Improve Data Literacy in Midsize Enterprises

Lakehouse in HCLS

Analysis By: Laura Craft, Adam Ronthal, Donald Feinberg

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

A lakehouse is a converged infrastructure environment that combines the semantic flexibility of a data lake, with the production optimization and delivery of a data warehouse. It supports the full progression of data from its raw and unrefined state, through the steps of refining it, to ultimately deliver optimized data for consumption.

Why This Is Important

Healthcare and life science (HCLS) data and analytics leaders grapple with emerging practices for optimizing a growing portfolio of analytics technologies, especially with rationalizing analytic work between the lake and adjacent data environments. A lakehouse is a physically converged infrastructure for lakes and warehouses, which aims to simplify architecture, improve efficiency, and reduce operational footprint. This would simplify the delivery of data science and advanced analytics into production.

Business Impact

For healthcare data and analytics leaders, many of whom will seek to accelerate AI engineering practices in the next five years, lakehouse architecture may provide the best complementary technical architecture. Organizations that adopt the lakehouse will benefit from a consolidated data management platform that supports skilled data scientists, engineers and informaticists, and casual business or clinical users, who consume data via prebuilt reports or dashboards.

Drivers

- Healthcare data and analytics leaders struggle with operationalizing data science projects and sharing insights broadly. Leading healthcare organizations are adopting AI engineering practices (namely DataOps, ModelOps and DevOps) to address this execution gap. A lakehouse provides a consolidated technology architecture to facilitate these practices.
- Lakehouses promise to fix quality, governance and efficiency problems caused by stagnant data in the lake. This typically occurs in organizations that are three to five years past their first data lake investment.
- Due to the relatively loose governance and standardization of the data lake, large datasets stay there beyond their active use. Actively used data, which should have been migrated to a more structured environment after exploration, can stay in the lake too long. Lakehouses promise to ameliorate both problems.
- Lakehouses help enterprises that consistently seek rapid and unencumbered access to data, and struggle with the processes and perception of delayed delivery associated with the data warehouse.
- Many cloud data warehouse solutions, and almost all cloud data lakes, already leverage semantically flexible cloud object storage as their storage of record. It is a natural progression to unify these storage environments, thus reducing the disparate and duplicate infrastructures.

Obstacles

- Many healthcare data and analytics teams already have a plethora of new data management tools and architectures. With the value of those tools often in question, data and analytics leaders are under pressure to demonstrate value from existing investments, rather than adopting yet another.
- The maturity of vendor-built lakehouse platforms is still developing. Some are strong with data lakes, but do not support the full range of transaction consistency or robust workload management capabilities that data and analytics leaders expect. Other lakehouse platforms are strong with data warehousing, but lack the broad data model support and data science or data engineering features of a data lake.
- Given that data lakes and the lakehouse concept are both still new, users are immature in their ability to design, deploy, and maintain complex data architectures.

Analyst Notes:

We position lakehouses for HCLS earlier than the cross-industry profile, in recognition of the additional complexities introduced by the regulations, existing architectures, and culture of healthcare organizations. We have nudged lakehouses up slightly up the peak as healthcare organizations organize their analytics environment and consider lakehouses, the data fabric, and other advancing data management capabilities. We expect accelerated adoption once the concept begins to take hold among leading healthcare organizations.

User Recommendations

- Investigate, pilot and adopt lakehouse technology using innovation funding, if it is available. Some early testing may deliver more efficient deployment in the midterm and long term.
- Employ a targeted use-case approach that solves specific problems and expands from there for long-term success. Expect your lakehouse to grow into many more use cases over time, just as lakes and warehouses do.
- Run your most complex workloads on the evaluated target platform in a proof of concept (POC) to make better-informed decisions about when a lakehouse approach is sufficient, and when a dedicated data warehouse may still be required.
- Evaluate security and governance capabilities to ensure they meet your enterprise standards and data requirements.

Sample Vendors

ChaosSearch; Databricks; Dremio; Incorta; Starburst; Tensile AI; Varada

Gartner Recommended Reading

Market Guide for Analytics Query Accelerators

Data and Analytics Essentials: Architect an Analytics Platform

Exploring Lakehouse Architecture and Use Cases

Does My Organization Need a Data Lakehouse?

Large Language Models in HCLS

Analysis By: Jeff Cribbs, Sharon Hakkennes, Michael Shanler

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Large language models (LLMs) in healthcare and life sciences (HCLS) are a type of foundation model trained on large volumes of unlabeled textual data. Applications can use LLMs to accomplish a wide range of tasks such as content generation, content summarization, search, code generation, language translation and conversational chat for HCLS industry applications.

Why This Is Important

LLMs have demonstrated surprising and significant capabilities across industries and are likely to be a standard feature of both personal and enterprise technology experiences in just a few years. Within HCLS, LLMs' achievements in demonstrating medical knowledge, engaging patient questions with empathy and insight, and parsing complex administrative scenarios have been remarkable. HCLS technology leaders have been tasked with planning a strategic response.

Business Impact

LLMs will first impact areas where they can be deployed with simple design patterns and areas with higher tolerance for error and correction. Early pilot examples include autogeneration of clinical trial intelligence reports, natural language interaction with business intelligence, ambient digital scribes and scientific literature search. Long term, LLMs have the potential to disrupt many critical functions — from research agents and office visit discharge notes to interoperability protocols.

Drivers

- The general release, explosive adoption and media attention given to ChatGPT — just one of many applications leveraging LLMs — has captured enormous mind share of healthcare business, clinical, and technology leaders alike. This has drawn significant strategic planning attention in 2023, though the real investment result is still to be seen.
- A steady cadence of healthcare technology vendors are announcing integration with LLMs.
- Large technology companies are making enormous investments in developing new LLMs and applying them to new application areas, demonstrating and broadcasting their achievements in a race to achieve a strong position in the LLM space. For example, Microsoft Health Bot is being integrated with Azure OpenAI services.
- Medical and healthcare policy research will drive deeper understanding of the risks and virtues of LLMs in healthcare use cases. As this emerges, HCLS organizations will gain comfort in embarking on more ambitious use cases.
- A pressing need to reduce the contribution of healthcare technology to worker (especially clinician) burn-out will drive investment in use cases like digital scribing and patient message responses.
- A tightening fiscal environment combined with structural changes in patient populations drive the need for increased efficiency of the workforce. This will drive long-term use cases like chat-based self-triage and navigation, and automated back-office functions.
- Initiatives focused on improving data literacy, analytics self-service and data-driven decision making will drive interest and investment in chat-based interfaces with business intelligence and analytics platforms, whether those are deployed within functional applications (EHR, ERP, claims processing) or enterprise analytics.

Obstacles

- Software vendors and consultants often use the GPT, LLM and generative AI terms interchangeably. This creates confusion about what the technologies actually are, the relationships between them, and what is realistically achievable with investments.
- There is widespread misunderstanding of the technology. This results in unproductive strategic discussions and reflexive governance decisions to restrict or prohibit use of LLM tools.
- Truly transformative use cases will require higher degrees of proven accuracy and safety than the 80% to 90% general performance LLMs demonstrate today. This last decile of improvement often reveals complicated fringe scenarios and engineering challenges that take many years to resolve.
- LLM outputs are not currently explainable — at least, not in the sense we are accustomed to in healthcare when we validate rule-based software, clinical protocols or efficacy studies. LLM use case adoption will be constrained by the need for transparency about decision making.
- There is significant uncertainty about the future regulatory environment for LLMs. Issues include intellectual property in LLM training datasets, privacy and confidentiality of enterprise data, and legal liability for content generated by the LLM.

Analysts' Notes: It is difficult to position a technology moving as quickly as LLMs in an annual publication. We take enterprise deployments of LLMs (largely via cloud APIs) as our numerator to arrive at the low end of 1% to 5% of HCLS organizations. We place LLMs at the peak of hype and predict a year of vendor integration announcements, regulatory starts and stops, and reality checks for the near-term value of today's LLMs. Next year, we are likely to see new, specific use cases emerging across the HCLS Hype Cycles.

User Recommendations

- Accelerate clear and effective internal communications by ensuring business, clinical and technology leadership teams have a common set of definitions for key terms in generative AI and a foundational understanding of how LLMs work, along with their risks.
- Establish a technology leader as the enterprise subject matter expert on generative AI by allocating time for this individual to digest industry updates as they unfold, create guidance and communications for leadership and governing experimentation and learning across the organization.
- Engage your patient populations directly by convening sessions with patient advisory groups to understand current utilization of ChatGPT, ascertain perceptions of the technology, observe first usage where possible and trial messaging for safe patient usage.
- Ensure your vendor partnerships are positioning their products and services to maximize the value and manage the risk presented by LLMs by making generative AI a regular point of discussion.

Innovation in Practice:

- Three health systems (UC San Diego Health, UW Health in Madison, Wisconsin, and Stanford Health Care) are piloting the use of GPT-4 to autogenerate responses to patient messages in the EHR. These draft responses are reviewed and revised as necessary by the clinician prior to sending.

Sample Vendors

Facebook; Google; Microsoft; NVIDIA; OpenAI; Palantir

Gartner Recommended Reading

GPT-4 Impacts and Actions in Healthcare and Life Science

Board Briefing: Understanding ChatGPT, Other Large Language Models and Their Risks

Quick Answer: What Healthcare Provider CIOs Need to Know About LLM Applications Such as ChatGPT

AI Design Patterns for Large Language Models

Synthetic Data in HCLS

Analysis By: Saru Mehta, Alexander Linden, Jeff Cribbs, Arun Chandrasekaran

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Synthetic data in healthcare and life science (HCLS) is a class of data that is artificially generated, instead of direct observations of the real world. Data can be generated using different methods, such as statistically rigorous sampling from real data, semantic approaches, generative adversarial networks or by creating simulation scenarios where models and processes interact to create completely new datasets of events.

Why This Is Important

HCLS organizations continue to develop AI and machine learning (ML) solutions for optimizing and innovating care delivery and accelerating clinical development. These AI/ML models require massive amounts of unbiased, statistically-significant patient data to perform better. Given the concerns around patient privacy and compliance standards in HCLS, this data is hard to leverage. Synthetic data offers an opportunity to overcome these challenges.

Business Impact

Synthetic data impacts HCLS organizations by:

- Accelerating research hypotheses while protecting privacy
- Enabling citizen data scientists by creating representative datasets
- Generating synthetic electronic health records (EHRs) to drive innovation and collaboration
- Developing clinical treatment models and healthcare software
- Facilitating research and collaboration on rare and complex diseases
- Increasing accuracy of healthcare ML models
- Eliminating sample bias

Drivers

- **Democratization and advances of foundational technologies:** These solutions, such as cloud and AI/ML, provide the ability to store, develop and compute at scale, enabling organizations to focus on more ambitious use cases.
- **Cost:** Creating synthetic data becomes inexpensive and fast once the generative model is set up.
- **Speed and reduced cycle time:** By switching to synthetic data, you can speed up or even avoid internal processes, lengthy contractual efforts and legal blockers which come with using real-world patient data.
- **Reduction of risk:** Synthetic data "unlocks" signals in private and sensitive data that otherwise could not be examined, providing the ability to safely experiment and simulate patient data.
- **Customized solution:** Synthetic data can be tailored with different characteristics and properties to fulfill healthcare-specific needs.

Overall, in the last 12 months, we have seen various HCLS organizations starting to leverage synthetic data for novel use cases (see below):

- **Enabling research collaboration among providers:** In November 2022, Atropos Health partnered with Syntegra to enable the users of Atropos Health's Green Button Informatics Consult and Evidence Platform to leverage Syntegra's synthetic data. This partnership aims to answer clinical research questions related to patient care by expanding the queryable data with synthetic datasets.
- **Enabling genomics research for life sciences:** Gretel Labs partnered with Illumina to create synthetic versions of real-world genomic datasets using AI.
- **Enabling disease modeling:** Researchers from the University of Jyväskylä's AI Hub Central Finland project created synthetic knee x-ray images to replace or complement real x-ray images in knee osteoarthritis classification.
- **Enabling machine learning:** The Veterans Health Administration (VHA) is using MDClone's synthetic data to create ML algorithms that are being used to forecast and minimize readmissions of patients with heart failure.

Obstacles

- **User skepticism:** User skepticism may be difficult for synthetic data to overcome, as users may perceive it to be “inferior” or “fake” data.
- **Quality of data generated:** Healthcare data is the most complex type, with tens of thousands of data elements in a patient’s electronic health record. Choosing a model to generate synthetic data might lead to insufficient detail or data designed with flawed assumptions. As a result, companies find it difficult to produce synthetic data with the highest level of accuracy.
- **End-user confusion:** As the number of data and model pipeline techniques increases, buyers struggle to determine what techniques to use to achieve their aims (synthetic data, federated learning, differential privacy) and how to use them together.
- **Revelation of sensitive details:** Synthetic data can still reveal many sensitive details about an organization, so security is a concern.

Analyst Notes:

We advance synthetic data past the Peak of Inflated Expectations, noting the frustrations of first adopters in driving utilization and value among stakeholders. We expect that frustration to elevate in the near-term but turn abruptly as best practices emerge and a preponderance of academic studies proves the credibility of synthetic data for clinical research. We expect mainstream adoption on the long side of two to five years.

User Recommendations

- **Recognize healthcare projects with synthetic data:** Identify and measure the business value, success, and failures of past synthetic data initiatives in healthcare, to create realistic possibilities and opportunities for continuous refinement.
- **Build a data literacy program:** Educate internal stakeholders on the benefits and limitations of synthetic data to improve digital and data literacy of the clinical workforce that would use ML tools and algorithms in clinical practice.
- **Develop clinical and data management guidelines:** In conjunction with analytics, security and legal teams, develop guidelines on appropriate usage of synthetic data for diagnostics, treatment, population health management and other forms of research.
- **Conduct a proof of concept to verify vendor claims:** Choose vendors that can generate realistic synthetic datasets for your use cases, provide tools to measure the effectiveness of synthetic datasets, and provide privacy filters to comply with regulations and internal compliance mandates.

Sample Vendors

Diveplane; Exploristics; Gretel Labs; IBM; MDClone; Octopize - Mimethik Data; Statice; Syntegra; Syntheticus; Syntho

Gartner Recommended Reading

Quick Answer: What Should Product Leaders Know About Synthetic Data in Healthcare?

Emerging Technologies: When and How to Use Synthetic Data

Innovation Insight for Synthetic Data

Data Monetization in HCLS

Analysis By: Jeff Cribbs, Jeff Smith

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Data monetization is a practice adopted by a healthcare and life science (HCLS) organization by which they make their proprietary data available to sell to external parties. The most mature examples are payers selling deidentified medical claims data to life science companies. This profile tracks monetization of new data types, utilizing new sharing mechanisms and vendors, targeted at new use cases, which are driving a new cycle of data monetization initiatives.

Why This Is Important

HCLS data and analytics (D&A) leaders have a mandate to derive more value from enterprise data assets and, in some cases, to identify opportunities for new revenue generation. The direct monetization of proprietary health data is one avenue that has received increased attention in recent years. This practice raises important ethical, strategic and technology considerations. D&A leaders are best positioned to act as SMEs for the organization, and ensure a cohesive and defensible strategy.

Business Impact

The direct business impact is quite straightforward. Large healthcare organizations, mainly providers and payers, can generate significant net new revenue. However, there are more complicated potential impacts, both positive and negative, in other areas, such as mission (i.e., contributing data for research and policy analysis), brand, security posture, vendor relationships and competitive positioning.

Drivers

- There is growing demand for new sources of revenue and funding, especially among health systems that have struggled financially during the pandemic. This is often accompanied by a fear of missing out on the revenue opportunity as competitors in the market participate in data monetization efforts.
- The absolutist stigma that has prevented many healthcare organizations from pursuing monetization initiatives have eased. This is a result of widely publicized data-selling practices across industries, demonstrable benefit of shared data to medical science and policy research, and the time data monetization practices have been a part of the healthcare market.
- Data marketplaces have matured, such as those hosted by data and analytics platforms (like Snowflake Marketplace) and industry cloud vendors (like AWS Data Exchange).
- Privacy-enhancing computing techniques, especially synthetic data and federated learning, allow for new use cases, and easier matching of data buyers and sellers by lowering the administrative overhead of accessing and profiling datasets.
- Emerging value propositions for data sharing more broadly, including publishing synthetic datasets for training of algorithms for digital health companies, public health monitoring, policy analysis and operational benchmarking.
- New ecosystem opportunities for data monetization are available, with tokenization vendors enabling enhanced value from connected health datasets, as well as more sophisticated analytics, providing improved visibility and insights from aggregated health data.

Obstacles

- Many global health systems effectively prohibit direct health data monetization, thereby reducing the total addressable market.
- Global regulation of data sharing, especially in the context of emerging technologies, are undeveloped areas of the law, creating uncertainty around the legal obligations of participants.
- Tightening the healthcare venture funding environment may lead to vendor consolidation.
- Concerns over negative press coverage raising alarm among consumers and regulators.
- Fear of losing visibility into the security of the data, the handling of the data by the broker and the payments made by data buyers.
- Lack of rational healthcare data pricing and lack of transparency of the public benefit make it difficult for healthcare organizations to assess the value in pursuing monetization initiatives.
- Limited technical and strategic resources to evaluate and design a data monetization initiative, which requires specialized data and technology competencies.

Analyst Notes: After a flurry of hype from 2020-2022, we position data monetization as just past peak in 2023. We expect some vendor consolidation and some lull in large new data selling partnerships, as early adopters await financial benefits of their upfront investments.

User Recommendations

- Assert yourself (or delegate a technology peer) as the subject matter expert (SME) for the organization on data monetization. Technology leadership is best positioned to understand the opportunities, costs and risks to the organization, while aligning interests and concerns across the organization.
- Organize a new data monetization initiative as a product line and ask for the technical and strategic resources you will need to make good recommendations to the organizations.
- Take a methodical and reasoned approach. Talk directly with vendors, especially if you know they are approaching senior leaders in your organization directly and creating an urgency to engage for “fear of missing out.”
- Adopt a partnering strategy for these initiatives, knowing that the developing health data ecosystem consists of many players working together (including, at times, competitors) for monetizing data to specific clients and use cases.

Sample Vendors

Dandelion Health; Datavant; Devron, HealthVerity; LexisNexis; Medicom; Segmed; Sitra; TripleBlind; Truveta

Gartner Recommended Reading

Quick Answer: Why Is There So Much Hype About Data Monetization in Healthcare?

Case Study: Data Ethics Decision-Making System (Highmark Health)

Quick Answer: How Do I Get Started With Data Monetization?

Life Science CIOs Must Deliver High-Value Analytics Solutions Using Real-World Data

ESG Measurement for HCLS

Analysis By: Jeff Cribbs, ck Andrade

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Environmental, social and governance (ESG) is the process for designing, managing and measuring an organization's environmental and social impacts, governance mechanisms, and policies. In healthcare and life science (HCLS), ESG measurement is an essential step toward aligning stakeholders on common sustainability goals.

Why This Is Important

ESG in HCLS presents an urgent and complex set of requirements for HCLS organizations. In recent years, many HCLS organizations have made aspirational commitments toward health equity, environmental sustainability and more inclusive governance practices. However, translating those aspirations into concrete metrics that represent the complex value propositions with investors, customers, regulators, partners and employees is daunting.

Business Impact

ESG measurement affects organizational strategy through:

- **Multistakeholder value propositions:** Leaders are extending ESG issues into all areas of organizational decision making, such as suppliers, facilities planning, human resources and patient advocacy strategies.
- **Risk balancing:** Enterprises need to assess the risks that come with the opportunities of sustainability initiatives.
- **Timing:** Sequencing high-value ESG initiatives is essential, especially in the current resource-constrained fiscal environment.

Drivers

- **ESG investing:** Investor appetite for ESG assets rose significantly for many years. 2023 looks likely to continue the long-term trend, as the benefits of ESG investing remain solid. While these trends directly impact private healthcare organizations, the effects naturally cascade to publicly funded and nonprofit entities.
- **Regulatory disclosures push:** The U.S., EU, U.K., China, India and Japan now either have in place or are soon to release new guidelines or regulations for ESG disclosures in financial reporting. Healthcare regulators (such as the National Health Services in the U.K. and the Joint Commission in the U.S.) have their own measurement requirements in various rollout stages.
- **Healthcare consumer and clinician activism:** Consumers and clinicians are increasingly insisting on the fact that HCLS organizations must engage in ESG activities to decrease healthcare waste, carbon emissions and negative social impact.
- **Customer preferences:** Customers are increasingly concerned about enterprises' environmental and social impact, and are making value-based choices in their purchases of products, choice of employers and votes for officials.
- **Policy:** Enterprises are increasingly impacted through the incentives and disincentives being put in place by policymakers. To hit targets, policymakers are putting in place taxation, bans, penalties and new market mechanisms.
- **Supply chain pressure:** Enterprises increasingly need valid supplier ESG performance and data from deeper in the value chain for Scope 3 greenhouse gas emissions. They are focused on responsible sourcing, assessing labor, health safety and environmental risks.
- **ESG strategy:** Ninety-four percent of public companies now either have or are in the process of setting up an ESG program. Further, boards of directors are increasingly stepping up their oversight of ESG, as they recognize its necessity for long-term resilience, healthcare mission alignment and financial performance.

Obstacles

- **Tyranny of urgent health issues:** HCLS organizations have in many cases been exempted from mandates or social pressure since they directly treat the current health needs of populations. Population health issues often take precedence within cash-strapped health organizations or regions.
- **Macroeconomic environment:** Looming recession and persistent inflation fosters an ongoing focus on cost, thereby leaving less room for ESG investments.
- **Internal governance:** There is no specific place for an ESG program to sit in the organization and there is often duplication of work. Responsibility ends up not clearly defined.
- **Data alignment:** ESG data gathering and comparability remain challenging due to the lack of standardization and maturity in the vendor space.
- **Quantifying benefits:** Improving ESG performance is often seen as an intangible benefit, difficult to connect to direct financial rewards.
- **Visibility of impact:** For many HCLS organizations, the majority of impact is further up the value chain (e.g., Scope 3 emissions) and organizations struggle to get visibility of supplier performance.

Analyst Notes: ESG measurement in HCLS lags many other industries, though this varies substantially by domain (health equity measurement is more adopted than carbon emissions, for example). We initiate coverage in 2023 because we expect this gap to close rapidly, as aspirational commitments are defined and embedded in regulations and norms.

User Recommendations

- **Link ESG objectives to long-term financial stability:** ESG needs to drive a business outcome of long-term sustainability of financial performance.
- **Build capabilities, not programs:** In order to make ESG truly integrated, focus on building sustainability capabilities to improve ESG, not just announcing programs.
- **Build in, don't bolt on, ESG capabilities:** Use existing capabilities and processes instead of creating new ones.
- **Cascade objectives:** After establishing ESG goals, targets, and metrics, cascade the key results needed from various groups and individuals to achieve those goals.
- **Include the value chain:** Identify environmental and social impacts under direct control, and also up and down the value chain. Track supplier performance.
- **Institute key performance indicators (KPIs):** Build ESG measures into KPIs for senior leaders across the organization, tying performance to compensation.

Innovation in Practice:

- UPMC has committed to a 50% reduction in emissions by 2030, appointed a Chief Medical Sustainability Officer, founded the Clinicians for Climate Action, and linked sustainability to health equity initiatives.

Gartner Recommended Reading

Market Guide for Enterprise Environmental, Social and Governance Software

Anatomy of an ESG Program

Prepare for the SEC's New Proposed Climate Disclosure Requirements

Social Determinants of Health Analytics

Analysis By: Mandi Bishop

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Social determinants of health (SDOH) analytics use a variety of data sources and analytic approaches to identify and predict nonmedical factors that contribute to health outcomes for individuals and communities. SDOH includes domains such as socioeconomic status, adequate food access, housing security and educational attainment. SDOH insights provide health equity and population health strategies as well as community resource network management (CRNM).

Why This Is Important

According to the World Health Organization, SDOH contributes more to health outcomes than clinical care, lifestyle and genetics combined. Population health management programs must address these nonmedical determinants if they are to deliver real health outcomes. Identifying and predicting nonmedical needs using SDOH analytics help healthcare organizations develop CRNM programs to fill unmet needs in partnership with community resources that deliver the necessary services.

Business Impact

SDOH analytics insights:

- Assess complex causes of outcome disparities and find opportunities for nonmedical interventions that could narrow gaps.
- Help identify prevalent unmet needs and community resource types to fill them.
- Improve population health and risk score stratification, thereby enabling more accurate reimbursement models for value-based care.
- Increase communication relevancy by contextualizing messages to address whole-person needs, which gives a higher chance of success.

Drivers

- Value-based care's continued expansion and success worldwide depend on the cost-effective improvement of health outcomes. Mounting research and policy evidence demonstrate the relationship between SDOH and population health, such as the statistically significant differences in infant mortality rates across ethnicities in the U.S. Globally, in aggregate, income is a primary determinant of infant mortality disparities, with high-income countries averaging four infant deaths per 1,000 live births while low-income countries average 47 deaths.
- SDOH-focused reimbursement schemes are proliferating to address use cases such as paying a maintenance company to repair a home heater during the winter or leasing apartments for chronically ill transient beneficiaries. SDOH analytics are critical to identify the scope of these challenges and their presence within the member population so that actuaries can forecast service utilization and cost.
- Healthcare organizations and regulators are aggressively launching equity-focused health initiatives with performance and reporting requirements as well as financial implications that demand the continuous and comprehensive analysis of SDOH. Community and person-level SDOH insights are critical to delivering value to health equity efforts.
- The vendor market for SDOH analytics solutions is rapidly expanding and includes entrenched data exchanges, cloud service providers and analytics applications as well as niche startups. Gartner has tracked more than 200 unique product announcements related to SDOH analytics since 2021.
- Traditional clinical methods to manage population health achieve incremental gains. Population health that integrates CRNM promises transformational benefits, and SDOH analytics is a foundational CRNM capability.

Innovation in Practice: The California Advancing and Innovating Medi-Cal (CalAIM) program provides payment for "community support in lieu of services" to address identified SDOH gaps through its managed medicaid program. This has provided a sustainable financial model for a variety of ecosystem partners to use SDOH analytics to identify and predict gaps.

Obstacles

- Data and accurate measures across SDOH domains vary in availability, sensitivity and usefulness to population health and care management. Teams must weigh the effort and ethics involved in curating and analyzing data domains with their ability to address or influence the measure. Some measures, like smoking status, are routinely identified during typical patient intake or member onboarding practices. These measures tend to have widely accepted evidence-based programs to improve measure performance such as smoking cessation initiatives. Conversely, measures such as exposure to domestic violence are sensitive so data capture is limited. Interventions that are societally complex lead healthcare organizations to relegate their involvement to episodic treatment and social service referrals.
- Privacy concerns and regulatory barriers restrict person-level SDOH data capture and exchange in some geographies.

Analyst Notes: Researchers, healthcare leaders, mainstream media and consumers alike are increasingly focused on the role of SDOH in driving health disparities in access and outcomes. Although there are barriers to acquiring and validating individual SDOH at scale, there are rapidly expanding data sources — both vended and publicly available — that support actionable population-level analysis. Thus, we are advancing this innovation farther past the Peak of Inflated Expectations and expect it to achieve mainstream adoption within five years.

User Recommendations

- Work with compliance leaders to understand privacy and regulatory restrictions for collecting and applying SDOH data.
- Seek IT, clinical and informatics team members who have expertise in SDOH data and analytics. Task them with assessing population health and health equity goals to identify likely determinants to prioritize for data sourcing.
- Initiate a pilot project to understand the feasibility of capturing and measuring nonmedical determinants by assessing data sources across SDOH domains and representative metrics that align with population health goals. Person- and community-level insights are generally not available from the same source.
- Explore whether existing data and analytics, population health or care management vendors offer SDOH analytics that are not currently part of your application or service contracts.
- Issue an RFI to the sample vendors listed in this profile and existing vendors that indicated they have SDOH analytics offerings.

Analyst Notes: Representative vendors in this category have capabilities in commercial data aggregators, population health management applications and community resource network management applications.

Sample Vendors

3M; Acxiom; Certilytics; Experian; IQVIA; LexisNexis Risk Solutions; Lightbeam; MedOrion; Socially Determined; Unite Us

Gartner Recommended Reading

Use Social Determinants of Health Analytics to Inform Health Equity Strategy

Innovation Insight for Advancing Population Health With Community Resource Network Management

Quick Answer: Factors Affecting U.S. Race and Ethnicity Data Quality in Healthcare and Life Sciences

Sliding into the Trough

Graph Analytics in HCLS

Analysis By: Laura Craft, Rita Sallam, Mark Beyer, Afraz Jaffri, Jim Hare

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Graph analytics techniques allow for exploring and discovering relationships between entities and concepts, such as organizations, people or transactions (e.g., care plan, clinical trial or authorization request). Graph analytics consists of models that determine the connectedness across data points. Graph analytics is typically portrayed via data visualization, where surfacing relationships can lead to better-informed insights and decisions.

Why This Is Important

Human health is replete with complex and poorly understood relationships between physical, social, behavioral and environmental determinants. The health and social care sectors — such as research, patient care, referrals, funding, payment and governance — create additional complexity. Graph analytics has unique capabilities to clarify, surface and optimize the complex relationships that determine health outcomes.

Business Impact

In its current state of technical maturity, graph analytics is best-suited to use cases with complex relationships between data from the same or closely similar business processes. These include:

- Precision health
- Health equity
- Fraud detection
- Public health monitoring
- Expert influence network analysis

- Health and social care network analysis
- Drug discovery, secondary indications and safety signals collection
- Quality and supply chain analytics

Innovation in Practice:

- Case Study: Entity-Event Knowledge Graph for Powering AI Solutions (Montefiore)

Drivers

- Data sources for healthcare organizations continue to proliferate. New data sources need to be quickly interrogated to understand their relationship to existing data, and what insight power the new data can contribute to analytics use cases. Graph analytics can expedite this discovery process.
- Healthcare ecosystems are becoming more complex and interrelated, requiring stakeholders to understand diverse relationships, the complementary and competing value propositions among them, the performance of key partners, and how best to optimize these relationships to achieve strategic goals.
- Graph analytics delivers both substance (i.e., surfacing unknown complex relationships) and style. It can be presented in novel and compelling visualizations. In an industry thoroughly unimpressed with the “slicing and dicing” or time series movie clips that drew audible gasps in healthcare boardrooms 15 years ago, multicontext visualization based on graph analysis has a unique ability to engage and illuminate healthcare audiences today.
- Graph analytics can accelerate the work healthcare data science and machine learning teams do in the early data discovery, preparation and hypothesis testing phases. Once again, this is especially true when working with novel data sources, where graphs can give data scientists an early and intuitive sense of the relationships within the data.
- Graph analytics can solve some of healthcare’s most challenging use cases that require a complete 360 degree understanding of the patient/member/consumer, such as health at home, public health monitoring and health equity.

Obstacles

- Because graph analytics delivers insight that is often many steps removed from the improved outcome, the business value can be difficult to quantify and attribute. With a long list of emerging data management and analytic tools competing for investment, this may delay investment in graph analytics by several years for most healthcare organizations.
- Graph technology is currently not well-suited to real-time event stream analysis, which makes certain use cases unfeasible, including home health monitoring, ambient sensing in-facility and digital engagement.
- Healthcare organizations rarely have the in-house skills required for graph analytics. These include knowledge and experience with the Resource Description Framework (RDF), property graphs, SPARQL Protocol and RDF Query Language (SPARQL), and executing graph analysis in Python and R.

Analyst Notes: The addition of graph analytics to various experiences in IT has accelerated its adoption and confusion. Many providers, implementers and even internal staff are applying “graph” to many more basic features, creating more hype with fewer results. As a result, graph analytics is moving closer to the Trough of Disillusionment as its true use, application and value get proven.

User Recommendations

- Apply graph analytics to use cases that involve complex pattern analysis among diverse functions within your organization, even across different entities in the surrounding ecosystem.
- Use innovation funding, where available, to pilot technologies or engage external technical talent to demonstrate graph analytics for the organization.
- Evaluate existing tools, vendor product development plans and ecosystem partners to determine their graph capabilities.

Sample Vendors

Cambridge Semantics; Elastic; Siren; Smarsh (Digital Reasoning); SparkCognition; Stardog; SynerScope; TigerGraph

Gartner Recommended Reading

Graph Technology Applications and Use Cases

Connecting the Dots: Why Graph Analytics Are Key to Understanding Human and Machine Misbehavior

How to Build Knowledge Graphs That Enable AI-Driven Enterprise Applications

Data Storytelling for HCLS

Analysis By: Amanda Dall'Occhio, Peter Krensky, Kurt Schlegel

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Data storytelling combines interactive data visualization with narrative techniques to deliver insights in compelling, easily assimilated forms. Analytic data stories aim to prompt discussion and collaborative decision making. Data stories can take several forms (including data-connected slideshows, annotated dashboards and graphic-design-style infographics). In contrast with dashboards used for monitoring, data storytelling techniques are used to inform, educate and persuade decision makers.

Why This Is Important

As an industry, healthcare and life science (HCLS) is awash in metrics, reports and dashboards. However, consumers of these analytic outputs are unable to discern key insights they contain or determine what next actions they should take to achieve strategic objectives. Data storytelling makes analytic outputs more consumable and actionable for a broader set of users. As such, it is a key component of a high-performing healthcare data and analytics program and a complement to data literacy.

Business Impact

The business value of data storytelling is delivered through a net improvement in data-driven decision making by healthcare stakeholders in a diverse range of use cases. Examples include the interactive visual aids that life science companies produce for prescribing physicians, group reports produced by payers for plan sponsors and quality reports produced by hospitals for quality teams and regulators.

Drivers

- Healthcare data and analytics leaders consistently echo a version of the refrain: “We have a tremendous volume of data but very little insight.” This sentiment is often the presenting symptom of decades of investment in digitization of core systems and a range of data management and data presentation technologies that are not delivering the expected value.
- The root cause of this value gap is often the difficulty of users in understanding and taking action on available reports and dashboards. When these frustrated healthcare users are shown the same underlying data using best-practice data storytelling techniques, they often experience a level of understanding and, in some cases, delight, that is rare in healthcare technology user experience.
- For external use cases, data storytelling can leave decision makers with a much clearer understanding of the value the organization is delivering. When a healthcare or life science organization loses business with these stakeholders on the basis of these reports (or superior reports from competitors), data storytelling changes from being an opportunity to a competitive necessity.
- The functional capabilities to create data stories are now widely available. Most cross-industry BI platforms now include a basic functionality to create and share data stories. These stories can take several forms — most frequently data-connected slideshows or storyboards, annotated dashboards and graphic-design-style infographics.
- Machine-generated data storytelling, via applied machine learning (ML), continues to gain market traction, offering the promise of news-style headlines and narratives generated automatically and specifically for the consumer.

Obstacles

- The use of data storytelling draws on an evolving set of skills, practices and technical capabilities (like metadata management) around how data is socialized and used in organizations. Many organizations do not have these skills in place.
- Most healthcare analytics vendors build their product on top of cross-industry analytics and business intelligence vendors. Unfortunately, they do not always take best advantage of the capabilities of the underlying platform.
- Machine-generated data stories will need to establish a high level of credibility among developers and stakeholders before they are deployed in fully automated workflows.
- Automated data storytelling, like many ML automation use cases, will introduce the risk of bias and overfitting that can create false or misleading narratives.

Analyst Notes:

Data storytelling shifted slightly on the Hype Cycle for 2023. There is recognition of the continuing adoption of AI/ML techniques advancing data storytelling capabilities and the Gartner strategic planning assumption that by 2025 data storytelling will be the most widespread way of consuming analytics. We have not yet seen significant enough adoption in HCLS in particular to advance to mainstream maturity. However, we expect mainstream adoption on the long end of two to five years.

User Recommendations

- Evaluate and upgrade your data storytelling technology portfolio. Investigate how your incumbent portfolio of technologies supports the creation of storyboard-style presentations with embedded analytical content.
- Evaluate and experiment with the data storytelling capabilities of a few vendors you have not yet engaged that offer both cross-industry and healthcare-specific solutions. Include representatives of your key analytics users in these evaluations.
- Recruit for data storytelling talent. Only the largest organization will have full-time data storytelling positions on staff. But BI developers, business analysts, consultative analytics account leads, data scientists and product managers can all bring more to the organization with training and strong experience in data storytelling.
- Prepare programs to develop and instill the mix of data visualization design, narration and presentation skills needed to support effective data storytelling.

Sample Vendors

Domo; Qlik; Tableau; Toucan; Yellowfin

Gartner Recommended Reading

Critical Capabilities for Analytics and Business Intelligence Platforms

Market Guide for Augmented Analytics

U.S. Payer CIOs: Use Emerging Data Storytelling Practices to Communicate Health Value to Employers and Groups

Health Data Curation and Enrichment

Analysis By: Laura Craft

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Health data curation and enrichment represents the processes and technologies that add value to data gathered from across the consumer/citizen/patient health and wellness continuum. These technologies and processes apply cleansing, normalization, and other enrichment services (such as episode grouping, predictive model scoring or outcome labeling) to maximize value in downstream consumption and use, and facilitate agile data governance.

Why This Is Important

At a time when data sources in healthcare are expanding rapidly and advanced analytic techniques, such as AI, are entering mainstream use, many healthcare organizations struggle with the basics of data quality and governance. Data curation and enrichment capabilities are becoming critical elements of advanced analytics architectures to derive value from new data sources, improve and automate data quality, and enable more sophisticated and pervasive use of data.

Business Impact

Successful deployment of a comprehensive health data curation and enrichment capability is a foundational component of the real-time health system, conducting digital healthcare, and the ability to execute population health and community-based care. When data curation and enrichment tools are well-deployed, they can significantly reduce the total cost and risk of data management and the incremental cost of connecting to new data sources.

Drivers

- New regulatory requirements from national eHealth initiatives and local government initiatives to share data more effectively in serving a common set of citizens across the traditional boundaries of health and social care.
- A growing number of healthcare “data strategy” initiatives, with significant funding, which focus on deeper data management capabilities, such as data quality and enrichment (as opposed to implementing new digital health applications or operational tools).
- Increasing use and maturity of data standards (such as Fast Healthcare Interoperability Resources [FHIR] and Observational Medical Outcomes Partnership [OMOP]) in analytic environments.
- Scarcity of talent, especially in data engineering and data science, which has driven a search for more automated ways to support analytics environments.
- The integration of analytics technology and operational technology architecture, which has created the requirement for a combined approach to curation and enrichment for these traditionally separated processes. In this way, data curation and enrichment is a key capability on the path to more comprehensive data fabric architecture.

Obstacles

- Creating a coherent solution architecture for health data curation and enrichment is complicated. Many data enrichment and curation hub technology and service providers either offer a broad platform across the data enterprise life cycle, or offer capabilities narrowly targeted on a particular data source (such as EHR-originating data), enrichment type or functional domain (such as care quality improvement).
- Many technology and service providers in this solution space promise “out-of-the-box adapters” for various data sources. However, end-user and vendor feedback suggests there remains substantial custom integration work performed in the background of most implementations.
- Problems with health data curation and enrichment are often several layers of technology behind the issue a clinical or business user is actually experiencing. Making the case for additional investment in the core capability can be challenging for healthcare technology leaders.

Analyst Notes: We have advanced health data curation and enrichment forward beyond the peak in 2023, in line with signals from payers and providers indicating increased focus on enterprise data management, but falling into the Trough of Disillusionment as the market irons out capabilities across different vendors. We will watch this technology and market closely to see how it aligns with emerging interoperability platforms.

User Recommendations

- Proactively assess data integration demands across the organization over the next three to five years. Cull insight from the organization's strategic plan and through other deliberate short- and midterm visioning exercises.
- Evaluate emerging data management frameworks, such as data fabric, and determine if today's data integration strategies will be sufficient in three years.
- Create requirements by mapping out patient, provider and administrative journeys. Document ideal movement of data across the enterprise. Update enterprise and information architectures to reflect the future state and develop your five-year roadmap.
- Prepare the business for a multivendor, build-and-buy, insource-and-outsource solution for enterprise data curation and enrichment needs. This is particularly true in organizations where business leadership may expect an incumbent megavendor or a new partnership with a digital giant to address all requirements. This is unlikely in the near term and midterm.

Sample Vendors

Alteryx; Availity; DataMotion; DXC Technology; IMAT Solutions; Informatica; Medical Informatics; Validic; Verinovum

Gartner Recommended Reading

Emerging Technologies: Critical Insights on Data Fabric

Consumer Journey Analytics in HCLS

Analysis By: Kate McCarthy, Faith Adams

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Consumer journey analytics is the process of building a complete understanding of a healthcare and life science (HCLS) consumer's journey, and using analytics to optimize the value of that journey. Consumer journey analytics collects data by tracking and analyzing the way consumers interact with their health and wellness over time.

Why This Is Important

HCLS organizations continue to accelerate the use of digital touchpoints for consumer engagement. These member, patient, provider and clinical trial participant journeys yield vast amounts of information that can be used to construct and analyze the consumer's experience. Consumer journey analytics enable HCLS CIOs to analyze and optimize consumer experiences across engagement touchpoints.

Business Impact

Healthcare and life science organizations stand to benefit from customer journey analytics due to:

- Higher customer satisfaction from seamless, personalized interactions across touchpoints.
- Increased visibility into consumer interactions.
- Better allocation of investment in functionality and capabilities for each engagement touchpoint.
- Refined consumer segments that increase the effectiveness of campaigns.
- Improved data-driven personalization that gives a more complete view of the consumer.

Drivers

- Consumer journey analytics is an essential tool for optimizing and personalizing HCLS consumer journeys. Leading HCLS organizations are increasingly using it to improve the attraction, conversion and activation of members, patients, providers, and clinical trial participants.
- In recent years, several tools and techniques for assessing and reimagining consumer experiences have gained significant adoption in healthcare. These include persona development, voice of the customer applications and journey mapping. The output of these efforts among leading organizations has helped foster an enterprise understanding of both the current and target state vision of consumer experience.
- Consumer journey analytics yield valuable insights into an HCLS consumer's needs and preferences. This enables the identification of the next best action for the consumer and the appropriate nudge to encourage the consumer to take this action, through analysis of data collected from engagement touchpoints. These touchpoints include human interaction (call centers, care manager, provider encounters), digital (websites, mobile, voice, wearables), assisted help (live chat and co-browsing) and virtual care.
- HCLS organizations can obtain increased revenue tied directly to satisfaction measures, medical risk and channel utilization.
- They can gain a better understanding of how improvement in experience relates to improved clinical and financial outcomes.
- They can also gain a direct line of sight into how the following are either supporting or preventing the ideal customer journeys — business partners within the sector (e.g., physician to physician), business partners across sectors (e.g., retail clinics and payers providers) and business partners across industries.

Obstacles

- HCLS organizations lag other industries in their use of consumer journey analytics. While comparable benefits are available to the industry, the complexity of HCLS journeys, continued dependence on face-to-face interactions, and the vast amount of data required remain barriers to widespread use and adoption.
- HCLS IT business leaders fail to use the minimum necessary touchpoints to build complete consumer analytics.
- Lack of data fluidity across siloed systems adds complexity to implementation and execution of journey analytics.
- HCLS organizations are overly reliant on today's legacy systems, such as electronic health records (EHRs) and core administration platforms. These technologies slow down progress in advancing both touchpoints and consumer journey work. As a result, this year, the innovation advanced further into the Trough of Disillusionment with two to five years before reaching maturity.

User Recommendations

- Adopt a total experience approach to address the insights employees need to support diverse healthcare and life sciences consumers.
- Prioritize projects that gather and analyze consumer journey data within new digital products and services.
- Examine opportunities to implement consumer journey analytics as a part of digital projects that transition call volumes from a call center.
- Use agile analytics approaches to quickly pilot consumer journey analytics for important personas. This will give business and IT leaders a sense of what is possible, and will guide investments in capabilities.
- Use consumer journey analytics to build a longitudinal understanding of consumer experience that includes encounters with other enterprises (e.g., external specialists); interactions with healthcare industry sectors (e.g., out-of-pocket costs for a procedure, life science patient support programs); employers (e.g., wellness incentives); social media; and consumer wearables.

Sample Vendors

[24]7.ai; Adobe; Genesys; Mercury Healthcare; Salesforce; SAP; Teradata; Virgin Pulse

Gartner Recommended Reading

Emerging Technologies and Trends Impact Radar: Customer Analytics for Customer Experience

Innovation Insight for Consumer Experiences in Healthcare and Life Sciences

Quick Answer: How Can U.S. Payers Overcome Consumer-Centric Product Complexity to Grow Revenue?

Where to Find Data to Inform Customer Experience Personas and Journey Maps

Healthcare Consumer Persuasion Analytics

Analysis By: Kate McCarthy, Faith Adams

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Healthcare consumer persuasion analytics uses consumer, clinical, experiential, engagement, social, environmental and behavioral data to derive and understand needs and preferences, key motivators and influencers of individual health behaviors and outcomes. It combines this insight with advanced analytics technologies and data sciences to identify techniques and tactics to persuade consumers to undertake actions that benefit their individual health.

Why This Is Important

Consumer persuasion analytics have potential to break through one of the biggest hurdles in the improvement of health outcomes — how to change behavior within individuals who may be uninformed, unmotivated or biased against changing unhealthy behaviors. Though this technology is in its early stages within HCLS, the use of similar technology within other consumer-oriented industries, such as retail and entertainment, has demonstrated success in nudging consumer behavior.

Business Impact

We expect the efforts of digital therapeutic companies, and the wellness and chronic care management efforts of HCLS organizations, will demonstrate the value of persuasion analytics within the next five years. Factors like use case and level of customer understanding will influence maturity and results. This trend is evidenced by progressive organizations investing in leaders to direct behavioral change and economics.

Drivers

- The increased use of digital touchpoints has driven HCLS organizations to invest in solutions that enable them to leverage persuasion techniques effectively.
- Estimates vary, but according to research published by the U.S. National Institutes of Health, consumers' physical environments account for up to 10% of health outcomes, while clinical care accounts for up to 20% of outcomes. Health behaviors account for 30% of outcomes, and social/economic factors account for 40% of outcomes. These health determinants matter more as value-based care programs shift risk and modify business model incentives.
- Population health and consumer health risk models, or chronic condition management such as obesity and diabetes, require more effective consumer behavior interventions and modifications. HCLS organizations and public health agencies seek to become as sophisticated as other consumer-oriented industries in analyzing consumer data that helps uncover both root causes of human behavior and effective nudges to change it.
- The ability to influence behavior and motivate action will be the key to transformative long-term management of cost and quality outcomes, while also improving consumer satisfaction.
- Life science and startup company growth is observed in the creation of digital therapeutics that capitalize on behavioral science. We also see interest among healthcare providers that are embracing value-based care models, and within healthcare payers who are using persuasion analytics to nudge members to undertake preventative, wellness and risk assessment activities.
- There have been demonstrated successes. For example, gamification with continuous monitoring to encourage diabetics to smooth out their A1C levels during the day has helped reverse Type 2 diabetes.
- This year, this profile continues further into the Trough of Disillusionment as adoption increases, but the anticipated behavior change and results don't always follow. It is expected to reach maturity in two to five years.

Obstacles

- While there is progress deploying consumer persuasion analytics that can successfully identify and nudge people to take a next best action, HCLS adoption continues to lag more mature industries, like retail and banking.
- Most HCLS companies lack sufficient data elements on their own to effectively build persuasion analytics, and struggle to scale digital behavior change, due to insufficient technologies and processes.
- Progress will be hindered by digital ethics issues that complicate the use of healthcare data for persuasion.
- We expect the complexity of persistently influencing consumer behavior over their journey will delay the maturity of healthcare consumer persuasion analytics technologies.
- Many organizations find legacy environments limiting, given the volume and velocity of data necessary to make persuasion analytics successful.
- Emotion AI and large language models like ChatGPT are apt to be more effective than consumer persuasion analytics, and will ultimately replace these solutions.

User Recommendations

- Evaluate your legacy platforms and architectures to determine the best deployment strategy. Persuasion analytics can be deployed through a variety of platforms, including EHR, CRM, MXDP and marketing technologies.
- Begin experimenting with incremental solutions, while preparing for investment in enterprisewide data fabric.
- Identify opportunities for persuasion analytics by focusing on use cases that require incremental nudges and lead to measurable outcomes.
- Develop trials that exploit short-term opportunities, while establishing long-term potential for personalized engagement.
- Engage vendors with the data that combines epidemiology, economics and consumer behavior insights, as well as the data scientists who serve the same function.
- Raise organizational awareness by teaming with marketing on education and influence campaigns.

Sample Vendors

CareCentra; Happify; Indegene; Lirio; ProChange; Softheon; Thrive Global; Virgin Pulse

Gartner Recommended Reading

Innovation Insight for Consumer Experiences in Healthcare and Life Sciences

U.S. Healthcare Payer CIOs Improve Member Engagement in Health and Wellness Programs

Healthcare and Life Science Business Driver: Total Experience Transformation

Cloud Analytics for HCLS

Analysis By: Laura Craft

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Cloud analytics delivers analytics capabilities as a service. It often comprises database, data integration and analytics tools. As cloud deployments continue, the ability to connect to both cloud-based and on-premises data sources in a hybrid model is increasingly important. In healthcare and life sciences (HCLS), industry clouds and cloud-based packaged applications are common paths to adoption.

Why This Is Important

Cloud-based analytics has many virtues for HCLS organizations — elastic storage and compute, machine learning and interoperability resource libraries, and collaborative research and data sharing environments. Among tech-forward healthcare organizations, cloud analytics has been the favored path for net new analytics environments for several years, often with a focus on data science. Yet, significant growth is still to come as more analytic workloads are initiated in and migrated to the cloud.

Business Impact

Cloud analytics benefits include:

- Innovative healthcare analytics use cases often require flexibility in storage and processing, more complex modeling approaches, novel data sources, and less latent data connections. Cloud can more rapidly accommodate these requirements, encouraging experimentation and agility.
- Industry clouds can more efficiently bring healthcare-specific privacy, security, standards-based data integration and data models, and clinical capabilities to a healthcare organization.

Drivers

- Significant acceleration of industrywide interoperability mandates and increased data sharing collaboratives (including federated learning environments for cross-industry research) are increasing adoption of cloud data platforms.
- The range of core cloud analytics capabilities is improving. This makes the cloud a viable option for healthcare organizations that have been reluctant to decommission on-premises data warehousing and business intelligence products. Reporting, dashboarding and interactive visualizations have long since reached parity in the cloud. But cloud adopters can now also subscribe to advanced analytics capabilities such as self-service data preparation, augmented data discovery and predictive modeling.
- Faster ability to innovate, agility and ease of integration are the top reasons healthcare organizations are moving analytics to the cloud.
- Healthcare analytics vendors have increasingly migrated their solutions to the cloud (such as population health analytics or market analytics) or added adjacent analytic products hosted in the cloud (such as electronic health record [EHR] or ERP).
- The growing cloud DBMS market (and the growing list of partnerships with healthcare megavendors) naturally supports and expands the cloud analytics market as companies embrace the cloud for managing their data.
- Representative vendors in the category are a combination of technology and service providers, some cross-industry and some healthcare-specific, who enable cloud analytics adoption in healthcare. Increasingly the services and capabilities being delivered are only available in the cloud-based solution.

Obstacles

- Security and project risk remains the top concern for mainstream healthcare organizations when moving to the cloud. While most would recognize that the cloud, once deployed, is at least as secure and reliable as on-premises solutions, the knowledge, talent and governance gaps to achieve secure deployment stymie many organizations.
- HCLS organizations' cloud adoption is impeded by the data gravity of their on-premises solutions. Data gravity means that as the amount of data grows and the levels of customization, integration and access needs increase, data has greater propensity to "pull" data services, applications, and even other data/metadata to where that data resides.
- Healthcare data and analytics leaders are charged with maximizing the value derived from existing investments. Many will delay investment in cloud to harvest "lower-hanging fruit" of data quality, existing analytics environments and improved data literacy among analytics users.

Analyst Notes: We position cloud analytics for HCLS right before the Trough of Disillusionment. Industry adoption is expected to be swift as industry value propositions, such as health equity, health-at-home and patient-enabled care, continue to compel adoption. Interoperability and data sharing are additional primary drivers as more governments regulate and organize standards and frameworks to facilitate exchange.

User Recommendations

- Establish a designed approach to move to the cloud in strategic increments, rather than a "lift and shift." Over time, cloud analytics will become the preferable deployment option in most healthcare analytics use cases. However, some analytics use cases will always require on-premises and hybrid hosting deployment for such reasons as service continuity during a disaster, immediate proximity to an on-premises operational system or regulatory restrictions.
- Be savvy about optimizing costs when working with cloud analytics vendors. While the cost structure is generally favorable (especially at implementation), poor governance or lack of experience with the cloud-hosting business model can result in surprise spending in the long term.

Sample Vendors

Alibaba Cloud; Amazon Web Services; Epic; EVYD Technology; Google; Infinitive; Microsoft; Oracle; Qlik; Sigma Computing

Gartner Recommended Reading

Data and Analytics Essentials: Architect an Analytics Platform

Decision Point for Selecting Cloud Analytics Solution Architecture

Adopt Cloud Analytics to Drive Innovation

Magic Quadrant for Analytics and Business Intelligence Platforms

Critical Capabilities for Analytics and Business Intelligence Platforms

Healthcare Consumer Insight as a Service

Analysis By: Kate McCarthy, Faith Adams

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Healthcare consumer insight as a service (HClaaS) refers to applications that accelerate organizations' consumer data and analytic capabilities. HClaaS is able to source data from multiple sectors or industries and employ advanced analytics techniques, to derive predictive or prescriptive health-related insight. These insights are computed in real time, at the individual and population levels, and delivered into a workflow application via APIs.

Why This Is Important

Healthcare and life science organizations must build consumer insight to drive increasing digital engagement. Today's enabling technologies, such as electronic health records (EHRs), claim systems and enterprise data warehouses are limited in their ability to drive relevant insights. Thus, CIOs are increasing investment in HClaaS as a way to establish more efficient paths to derive value from data.

Business Impact

HClaaS is valuable to healthcare and life science organizations because it drastically lowers the barriers to adoption for advanced analytics (including AI). It reduces the size requirement for many population health or care management use cases, where sufficient samples are needed to generate meaningful insight. Furthermore, it presents a less risky, more agile solution path for small analytics groups taking their first steps into consumer analytics and reducing impact to talent.

Drivers

- The applications that control healthcare workflows contribute to today's inefficiencies. EHRs, claims processing, revenue cycle management and care management applications universally lack the analytic deployment agility found in the best workflow systems across industries, such as digital commerce or logistics.
- HClaaS offers a mechanism to gain and apply the unique value of advanced analytics at the individual consumer level to critical healthcare workflows. It can alleviate the requirements of large datasets, integration of partner data sources, in-house data science talent, advanced analytics technology and decision hub architecture for putting predictions into workflow.
- In some cases, a middle ground of analytic marketplaces from industry cloud providers, commercial data resellers and public data aggregators will provide the best foothold for further progress.
- In the future, the HClaaS space is well-suited to becoming a "packaged business capability" in the model of the composable healthcare enterprise. HClaaS is especially important to small or midsize healthcare payers and providers that often lack internal resources to execute advanced data and analytic strategies.
- Early use cases for HClaaS will advance current analytic capabilities. For example, at-risk entities engaging in care management activities will replace their batch loads of "chase lists" and stratification scores with case-level API calls. These consumer risk and stratification scores will replace or supplement the scores often generated from conventional licensed predictive models.
- The addition of consumer and sociodemographic data will provide better targeting and intervention strategies, especially in addressing leading determinants of health and healthcare costs.

Obstacles

- There is little consistency in vendor offerings for HClaaS, which are available from diverse vendors, including EHRs, analytic platforms and martech solutions. Healthcare and life science organizations can struggle to identify the best solution for their needs.
- Data aggregation can be challenging for organizations with siloed, departmental-level data repositories.
- HClaaS delivered through martech are frequently limited to the marketing use case they are implemented to support, rather than being extensible to cross-enterprise use cases (care pathway management, care management, quality improvement).
- HClaaS continues to advance through the Trough of Disillusionment in acknowledgment of the enormous challenges any organization faces in delivering pervasive analytic insight into the most crucial healthcare workflows.

User Recommendations

- Evaluate HClaaS solutions as an emerging, and potentially crucial, component in their enterprise analytics strategy to accelerate or replace internally developed healthcare consumer analytics.
- Prioritize use cases that are experimental and stand to gain the most lift from multisector data sources combined with advanced analytics techniques, and that can be delivered directly into a workflow application.
- Differentiate next-generation care management by infusing analytics into workflows and applications.
- Meet with the chief medical officer or the chief medical informatics officer to discuss the care management use case and jointly attend an exploratory call with one of the representative vendors.

Sample Vendors

Cotiviti; Decision Point; EarlySign; HMS Networks; LexisNexis; Softheon (NextHealth Technologies)

Gartner Recommended Reading

Innovation Insight for Continuous Intelligence

Innovation Insight for Consumer Experiences in Healthcare and Life Sciences

Deliver Business Outcomes for Customer Analytics With Our Practical Data and Analytics Strategy and Operating Model

Climbing the Slope

Advanced Analytics Architecture for Providers

Analysis By: Laura Craft, Jeff Cribbs

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Advanced analytics architecture for healthcare providers represents the next-generation approach to derive value from data. Traditional provider analytics architecture typically includes information portals (reports and dashboards) and an analytics workbench (data exploration). Advanced architecture adds data science and machine learning platforms (for advanced modeling), as well as a decision hub (to deploy real-time insight into operations), and coordinates all four functional elements.

Why This Is Important

The healthcare industry has experienced rapid digitization, and with that, accelerated demand for new analytics capabilities. Because no single vendor today will be able to fulfill all the analytic demands of a health system, healthcare data and analytics leaders must design their architecture to adapt to an ever-changing spectrum of use cases and consumption modalities. This spectrum ranges from dashboards to process automation.

Business Impact

The effectiveness of a healthcare provider's analytics architecture is paramount to its success. This architecture is a necessity for providers to be able to pervasively influence actions, often in real time, across operational, clinical and business processes. This architecture also prepares a provider organization to adopt AI engineering with its more sophisticated emphasis on DataOps, ModelOps and DevOps.

Drivers

- Healthcare providers increasingly acknowledge advanced analytics generally, and artificial intelligence in particular, as critical enterprise competencies. This is especially true in academic medical centers with strong affiliate informatics research labs or in regions where COVID-19 response included rapid deployment of analytic models.

- Megasuite EHR vendors continue to build out their advanced analytic capabilities. This includes both marketplaces with prebuilt analytic models and reporting and development environments for local models (for example, Epic's cloud-based advanced analytics environment, Nebula). This trend has the dual effect of normalizing the use of analytics in clinical and administrative workflow while also clarifying the ongoing need for more adaptable analytics architecture outside of the EHR.
- The continued growth in the volume, variety and velocity of data sources originating outside of the EHR (such as remote monitoring devices, genomic data, asset tracking and ambient sensing) demands a more flexible and agile architecture that supports more advanced data orchestration pipelines.
- Healthcare analytic vendors are significantly updating their architecture to support more complicated data needs and advanced analytic demands.
- There is increased momentum to modernize D&A environments as part of the migration to the cloud in order to take advantage of advanced data management features, increased collaboration opportunities and faster time to innovation.
- Digital analytics architecture for healthcare providers advanced significantly this year, largely due to the accelerated investment in data science and machine learning.

Obstacles

- Providers' data and analytics investments are often focused on urgent, departmental capability gaps. These capabilities are typically supported in a segmented fashion — with canned reporting tools working in isolation from more sophisticated data science and machine learning platforms.
- Identifying critical capability gaps requires a view across departments and use cases. However, in some provider organizations, the organizational structure does not allow for a data and analytics leader who has this view (such as a CDAO). Where there is such a leader, he or she often does not have the budget or decision-making authority to advocate for the best architectural investment over, say, an "EHR-first" solution approach.
- Many organizations will see "lower hanging fruit" in cleaning up existing data, reducing latency of key reports and dashboards, or initiating fundamental data literacy programs. These initiatives will compete for limited budget dollars with longer-term investments in architecture.

Analyst Notes:

We position advanced analytics architecture for healthcare providers right before the Plateau of Productivity. We expect this profile to move quickly over the next year as the coordination of the “four functional elements” enumerated in the definition begins to catch up with technology investments that have already been made. We will follow the market closely to see how the evolution of the advanced architecture as defined here plays out with cloud analytic and health data platform vendors.

User Recommendations

- Prepare executive leadership to invest in new data management and analytics tools, as neither the legacy enterprise data warehouses (EDWs) nor the megasuite EHRs will be sufficient to enable the data and analytics capabilities required to be competitive in the healthcare provider market today.
- Ensure that data and analytics has prominent placement in your organization’s business and technology strategy.
- Consider what data fabric capabilities your incumbent vendor(s) offer that can help advance your analytic and data science/ML services.
- Address organizational structures that are inhibiting progress toward digital analytics architecture. While the right organizational structure will vary substantially based on the business and operating model, all organizations need a leader focused on analytics, with a cross-departmental purview. This leader should be empowered with decision-making authority and budget to prioritize analytics architecture across the enterprise.

Sample Vendors

Arcadia; Dimensional Insight; Epic; Health Catalyst; Innovaccer, Oracle; SAS; Snowflake

Gartner Recommended Reading

Toolkit: Creating a Modern Data and Analytics Strategy and Operating Model

Critical Capabilities for Analytics and Business Intelligence Platforms

Evolving Capabilities of Analytics and Business Intelligence Platforms

Critical Capabilities for Data Science and Machine Learning Platforms

Advanced Analytics Architecture for Payers

Analysis By: Jeff Cribbs, Laura Craft

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Advanced healthcare analytics architecture represents payers' next-generation approach to deriving value from data. Traditional payer analytics architecture typically includes information portals (reports and dashboards) and an analytics workbench (data exploration). Advanced architecture adds data science capabilities (for advanced modeling) and a decision hub (to deploy real-time insights into operations), and coordinates all four functional elements.

Why This Is Important

Advanced analytics architecture enables more pervasive and forward-looking insight than payers can accomplish with conventional architecture. In critical areas like actuarial science, provider network analysis, care management and payment integrity, the addition of advanced analytics has enabled payers to differentiate their offerings and outperform their competition. This architecture also prepares a payer organization to adopt AI engineering.

Business Impact

Payers that have adopted advanced analytics architecture have seen the greatest impact in consumer engagement, population health management, payment integrity and provider analytics. More recently, consultative analytics programs that provide ad hoc analysis as a part of external relationship management (such as relationships with employer groups), have started to utilize more advanced statistical methods and decision intelligence to improve performance and demonstrate value.

Drivers

- Most large healthcare payers now have one or more installations of a data science and machine learning platform, at least a few data scientists utilizing them, and a handful of projects or pilots completed, some successfully, many less so. This has normalized the presence of next-generation analytics talent and technology (at least in some departmental pockets) and laid a foundation for accelerated investment.
- Gartner clients say that partnership approaches with hyperscalers for cloud-based analytic services — especially Amazon Web Services (AWS) and Microsoft — have more of a defined "playbook" feel, which aids adoption. This approach has accelerated further still with recent strategic partnerships between cloud providers and licensed advanced analytic tools, such as Microsoft Azure and SAS's Viya platform.
- Payer business and clinical leadership increasingly recognize the opportunity to derive more insight from nonconventional payer data sources. The most important of these new sources are electronic health record (EHR) — originating data, which will be increasingly available in Fast Healthcare Interoperability Resources (FHIR) resources, with new batch transmission requirements and vendor offerings for conversion to relational environments. Other novel data sources include member wearables, call center recordings and home health workforce monitoring.

Obstacles

- Payer data is generally poorly governed, buried in organizational silos and hard to access. The renovation of the data core toward a "data fabric" architecture is the single greatest project facing payer analytics.
- Many payers have analytic environments with duplicative capabilities and use cases. This creates internal rivalries and confusion among various stakeholders about which environment is best suited to addressing new analytic requirements.
- Payer-specific solution providers have been slow, relative even to their healthcare provider counterparts, to add advanced analytic capabilities to their offerings.
- Payers chronically underinvest in the deployment technologies and operational systems that can make analytic insight and automation pervasive in the business. In all key "next generation" payer technology spaces, such as care management, core admin, and provider network management — the ability to deploy advanced analytics into the workflow is a critical capability.

Analyst Notes: As anticipated in our 2022 write-up, we observe significant investment in governing the coordination of the "four functional elements" of the architecture. The profile is on track to graduate in 2024 with 35 to 45% adoption. Note that adoption is driven substantially by larger payer organizations (namely Humana, UnitedHealth Group and Elevance Health). Representative vendors in this category cover various components of the architecture or strategic consulting services in this direction.

User Recommendations

- Begin by incorporating advanced analytics in your enterprise-level data and analytics strategy and operating model (DASOM). This strategy must rationalize data management and analytic capabilities, and guide investment decisions in new capabilities (see Creating a Modern, Actionable Data and Analytics Strategy That Delivers Business Outcomes).
- Invest today in data governance, master data management and enterprise services integration, which are concrete steps toward the data fabric foundation that will position payers well as new tools, functions and use cases become available.
- Investigate composable architecture, which presents special opportunities and efficiencies to payers who seek a more scalable way to deploy analytic insight into operational technology, through the creation of analytic packaged business capabilities.

Sample Vendors

RapidMiner; SAS Institute; Tensile AI; Teradata; TIBCO Software; Quantiphi

Population Health Management Solutions

Analysis By: Amanda Dall'Occhio, Roger Benn, Jeff Cribbs

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Population health management (PHM) solutions are sets of IT capabilities and related services that enable healthcare organizations to achieve health, cost and experience goals for a discrete population of individuals. These capabilities commonly include data integration, performance analytics, care management and patient engagement.

Why This Is Important

Many global health systems struggle with a common set of challenges: rising medical costs, disparities in access, inconsistent clinical outcomes and aging populations. As an operational model of value-based care, PHM focuses on care management and coordination initiatives to improve the quality of care and reduce healthcare costs.

Business Impact

Fully implemented PHM technology will enable improvement in most aspects of healthcare operations. However, organizations typically deploy PHM progressively as they gain experience in value-based care, learn more about the technology, and find more of their financial incentives reliant on successfully operating in a PHM model. The typical progression, in order, is: (1) data management, (2) reporting, (3) performance management, (4) workflow (care management) and (5) patient engagement.

Drivers

- Value-based care continues accelerating in both public and privately funded health systems. More organizations are signing at-risk contracts, and more money is at stake in renewing those contracts.
- National, state and local e-health initiatives often include more mature PHM capabilities — such as integrating health and social care, community-based care coordination, and remote patient monitoring.
- Business models are changing incrementally, and organizations often install initial technology without a full vision of PHM capability. However, the vendor market has adapted and many offer a sequential playbook and modular capabilities to better align to the roadmap stage and progress.

Obstacles

- Healthcare organizations often make PHM investments very narrowly to support the new requirements of a value-based contract or initiative. This includes acquiring claims data, managing an attribution patient registry or maintaining certified quality reporting. The lack of a comprehensive PHM technology vision means initial capabilities are often not forward-compatible with new capabilities or requirements.
- Technology solution design for PHM, particularly for healthcare providers, is complicated by a lack of comprehensive PHM vision from healthcare organizations. This is also the case for PHM capabilities that overlap with adjacent spaces (like electronic health record [EHR], CRM and health information exchange [HIE]) and confusing vendor hype.
- Megasuite EHR vendors that offer PHM capabilities often do not keep pace with more mature PHM program requirements. However this is slowly shifting.
- Efforts to configure the EHR for PHM compete with a long list of conventional care delivery-focused EHR optimization projects.

User Recommendations

- Ensure that immediate PHM solution decisions are compatible with a robust population health vision that extends at least five years into the future.
- Evaluate your incumbent EHR vendor objectively by asking for its reference clients with the most mature population health implementations. Then compare those experiences with PHM vendor references with similar program maturity levels.
- Assess the vendor's support model beyond the technical nuts and bolts. Understand their commitment to helping you transform your operations and achieve your targeted PHM objectives.
- Explore each vendor's built-in social determinants of health (SDOH) and community resource connection capabilities, as well as the ability to incorporate new external data sources as best practices continue to advance.

Sample Vendors

Arcadia; CareEvolution; Cedar Gate Technologies; Forward Health Group; Health Catalyst; Innovaccer; Lightbeam Health Solutions; Optum; Persivia

Gartner Recommended Reading

Population Health Management Framework for Healthcare Provider CIOs

3 Critical Views of Population Health Management Capabilities for Healthcare CIOs

Healthcare CIOs: Enable Real-Time Ecosystem Collaboration to Excel in Value-Based Care

Appendixes

See the previous Hype Cycle: Hype Cycle for Healthcare Data, Analytics and AI, 2022

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 2: Hype Cycle Phases

(Enlarged table in Appendix)

Phase	Definition
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the innovation to reach the Plateau of Productivity.

Source: Gartner (July 2023)

Table 3: Benefit Ratings

Benefit Rating ↓	*Definition* ↓
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2023)

Table 4: Maturity Levels

(Enlarged table in Appendix)

Maturity Levels	Status	Products/Vendors
Embryonic	In labs	None
Emerging	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
Adolescent	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
Early mainstream	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
Mature mainstream	Robust technology Not much evolution in vendors or technology	Several dominant vendors
Legacy	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
Obsolete	Rarely used	Used/resale market only

Source: Gartner (July 2023)

Document Revision History

Hype Cycle for Healthcare Data, Analytics and AI, 2022 - 27 July 2022

Recommended by the Author

Some documents may not be available as part of your current Gartner subscription.

Understanding Gartner's Hype Cycles

Tool: Create Your Own Hype Cycle With Gartner's Hype Cycle Builder

2023 Healthcare Provider Business Drivers of Technology Decisions

2023 Life Science Business Drivers of Technology Decisions

2023 U.S. Healthcare Payer Business Drivers of Technology Decisions

Infographic: IT Score for D&A Benchmarks for Healthcare

Infographic: Artificial Intelligence Use Case Prism for the U.S. Healthcare Payer Industry

Infographic: Artificial Intelligence Use-Case Prism for Life Science Manufacturers

Table 1: Priority Matrix for Healthcare Data, Analytics and AI, 2023

Benefit ↓	*Years to Mainstream Adoption*			
	Less Than 2 Years ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
Transformational		Large Language Models in HCLS	Data Fabric in HCLS Emotion AI in HCLS	
High	Advanced Analytics Architecture for Payers Advanced Analytics Architecture for Providers Population Health Management Solutions	Consumer Journey Analytics in HCLS Data Literacy for HCLS Data Sharing in HCLS ESG Measurement for HCLS Healthcare Consumer Persuasion Analytics Health Data Curation and Enrichment Social Determinants of Health Analytics Synthetic Data in HCLS	Adaptive D&A Governance in HCLS AI Engineering in HCLS Federated Machine Learning in HCLS Healthcare Analytics on FHIR Health Equity Analytics Next-Generation Healthcare Research Environments	

Benefit	*Years to Mainstream Adoption*			
↓	***Less Than 2 Years*** ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
Moderate		Citizen Data Science in HCLS Cloud Analytics for HCLS Data Monetization in HCLS Data Storytelling for HCLS Healthcare Consumer Insight as a Service Lakehouse in HCLS	Graph Analytics in HCLS	
Low				

Source: Gartner (July 2023)

Table 2: Hype Cycle Phases

Phase	*Definition*
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the innovation to reach the Plateau of Productivity.

Phase ↓	Definition ↓

Source: Gartner (July 2023)

Table 3: Benefit Ratings

Benefit Rating ↓	Definition ↓
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2023)

Table 4: Maturity Levels

Maturity Levels ↓	*Status* ↓	*Products/Vendors* ↓
Embryonic	In labs	None
Emerging	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
Adolescent	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
Early mainstream	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
Mature mainstream	Robust technology Not much evolution in vendors or technology	Several dominant vendors
Legacy	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
Obsolete	Rarely used	Used/resale market only

Source: Gartner (July 2023)