RHINO HEALTH

Connecting The World's Health Data With Federated Computing

February 2024

Rhino Health's mission:

Harness the power of federated computing to improve healthcare outcomes, by creating an activated, global data network

Healthcare data is a growing asset that could unlock tremendous value if accessible and 'activated'

Healthcare data is exploding…

30% — Proportion of global data volume generated by healthcare[1]

36% — CAGR of healthcare data (fastest growing sector)[2]

>50 — Petabytes of data produced annually by the average hospital[3]

…but its value remains locked

97% — Proportion of healthcare data that currently goes unused[3]

>$300B — Estimated annual US GDP benefit of liberating healthcare data[4]

Securely unlocking healthcare data for innovation is necessary to transform the economies and healthcare trajectories of Korea, the US, and the world

1 RBC Capital Markets. The healthcare data explosion. Link; Coughlin et al. Looking to tomorrow's healthcare today: a participatory health perspective. *Internal Medicine Journal* (2018). Link
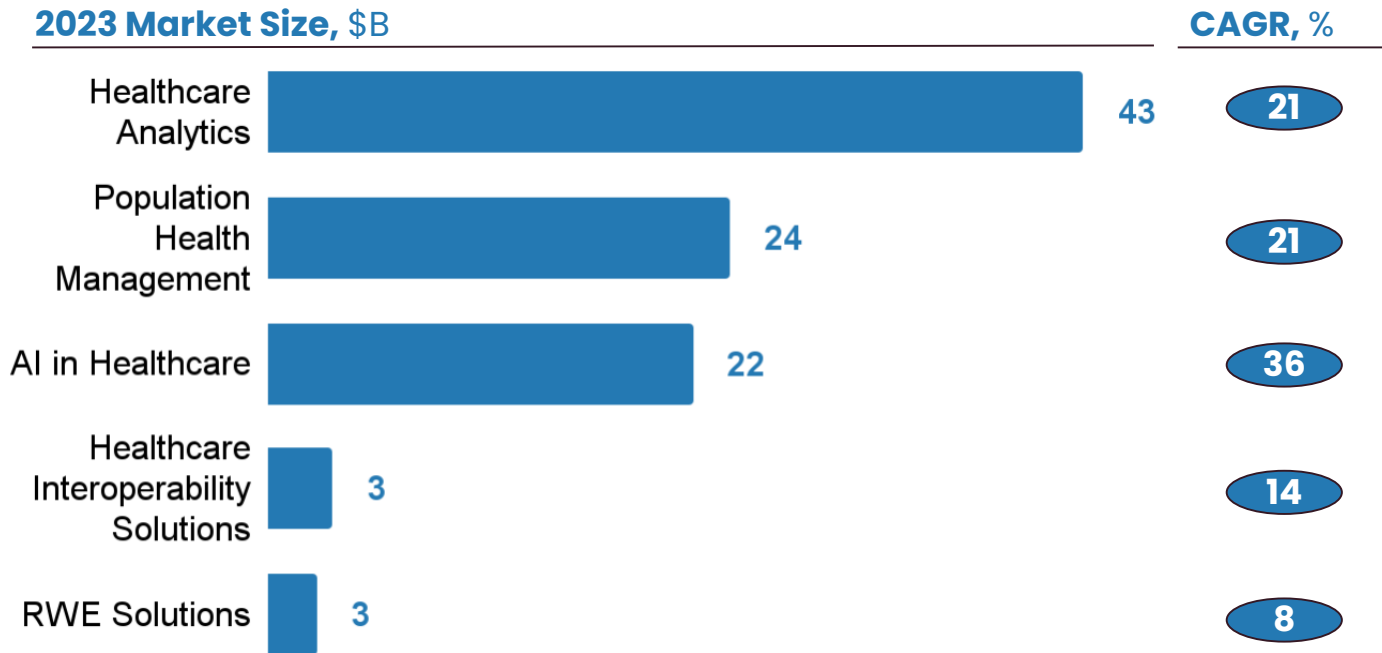2 IDC. The Digitization of the World: From Edge to Core. Link
3 World Economic Forum. 4 ways data is improving healthcare. Link
4 Manyika, J et al. McKinsey Global Institute (2013). Link

As a result, **significant investments** were made and **rapidly growing segments** have emerged

Data already drives large, fast growing markets[1-4]

2023 Market Size, $B

CAGR, %

Segment	2023 Market Size, $B	CAGR, %
Healthcare Analytics	43	21
Population Health Management	24	21
AI in Healthcare	22	36
Healthcare Interoperability Solutions	3	14
RWE Solutions	3	8

$25B in investments in digital health in 2023 will fuel future growth[5]

The majority of tools focus on 'data centralization' approaches

1 https://www.grandviewresearch.com/industry-analysis/healthcare-analytics-market
2 https://www.grandviewresearch.com/industry-analysis/real-world-evidence-solutions-market-report
3 https://www.grandviewresearch.com/industry-analysis/healthcare-interoperability-market#
4 https://www.grandviewresearch.com/industry-analysis/population-health-management-phm-market
5 https://www.beckershospitalreview.com/hit-speaker-series-q-a/63-system-execs-share-the-most-valuable-tech-investments-in-the-last-2-years.htm l

Regulators push for real-world evidence in product development, expanding the horizon of data use

US FDA: US Food and Drug administration released guidance indicating an increasing acceptance of real-world evidence for drug approval[1]

Korea MFDS: Korean Ministry of Food and Drug Safety also recognizes real-world evidence as clinical trial data for approvals of medical technologies[2]

EU EMA: European Medicines Agency released real-world evidence framework that highlights its potential for regulation and need to improve access[3]

As a result, real-world evidence is leveraged by >90% of biopharma, with the potential to unlock >$300M in annual value per company[4-5]

1 https://www.pharmaceutical-technology.com/news/fda-issues-guidance-on-using-real-world-data-for-drug-development/?cf-view
2 https://www.koreabiomed.com/news/articleView.html?idxno=21257#:~:text=RWE%20in%20medical%20devices%2C%20as,by%20using%20medical%20devices%2C%20electronic
3 https://www.ema.europa.eu/system/files/documents/report/regl-real-world-evidence-framework-support-eu-regulatory-decision-making-report-experience-gained_en.pdf
4 https://www2.deloitte.com/us/en/insights/industry/health-care/real-world-evidence-study.html
5 https://www.mckinsey.com/industries/life-sciences/our-insights/real-world-data-quality-what-are-the-opportunities-and-challenges

The problem: Increasing volumes of data need to be shared but centralizing does not scale well

High Cost

- Regulatory hurdles (HIPAA, GDPR)
- Redundant data and under leverage of existing compute infrastructure
- Complicated contracts and enforcement mechanisms
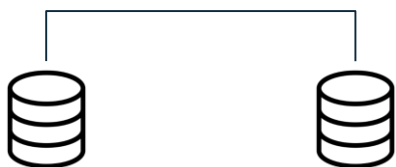
Low Yield

- Redacted data
- Mono-modal data
- 'Stale' data (not refreshed frequently)
- No linkage to legal medical record - reduces 'actionability' of insights

The solution: Moving to a federated model that builds on previous investments in interoperability
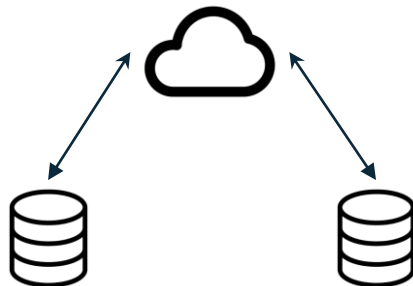

Federated Data

Data **mapped to common data models**

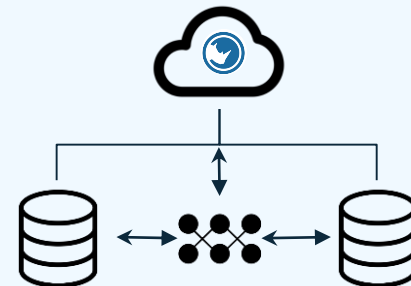**Interoperability**

Federated Analytics

Aggregated analytics, one data silo at a time, for basic analytics
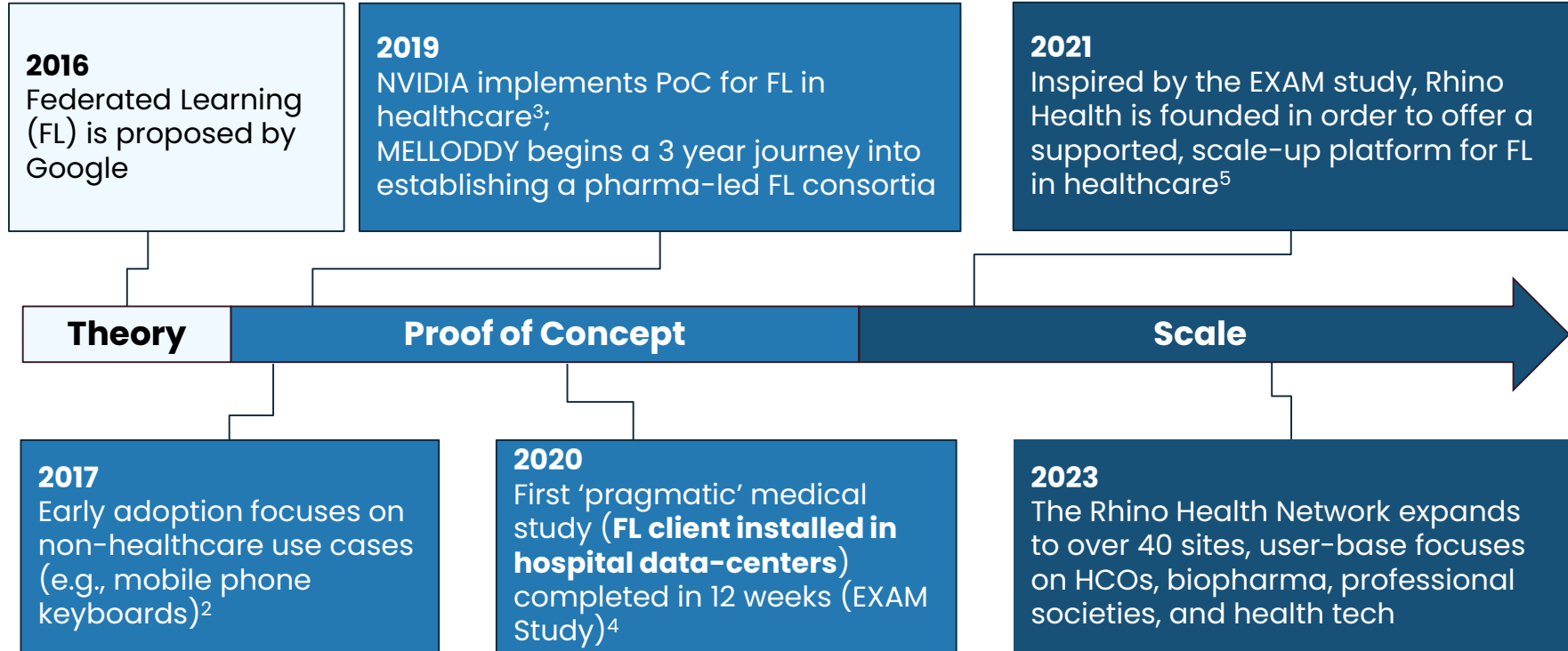
Discoverability

Federated Computing

Edge-computing for seamless processing of AI-ready data

Leverage & Usability

Federated Computing has worked in other industries; We are scaling it as a tech platform for healthcare

2016
Federated Learning (FL) is proposed by Google

2019
NVIDIA implements PoC for FL in healthcare[3];
MELLODDY begins a 3 year journey into establishing a pharma-led FL consortia

2021
Inspired by the EXAM study, Rhino Health is founded in order to offer a supported, scale-up platform for FL in healthcare[5]

Theory | **Proof of Concept** | **Scale**

2017
Early adoption focuses on non-healthcare use cases (e.g., mobile phone keyboards)[2]

2020
First 'pragmatic' medical study (**FL client installed in hospital data-centers**) completed in 12 weeks (EXAM Study)[4]

2023
The Rhino Health Network expands to over 40 sites, user-base focuses on HCOs, biopharma, professional societies, and health tech

1 McMahan et al 2016. Link
2 Google Research Blog Federated Learning: Collaborative Machine Learning without Centralized Training Data. Link
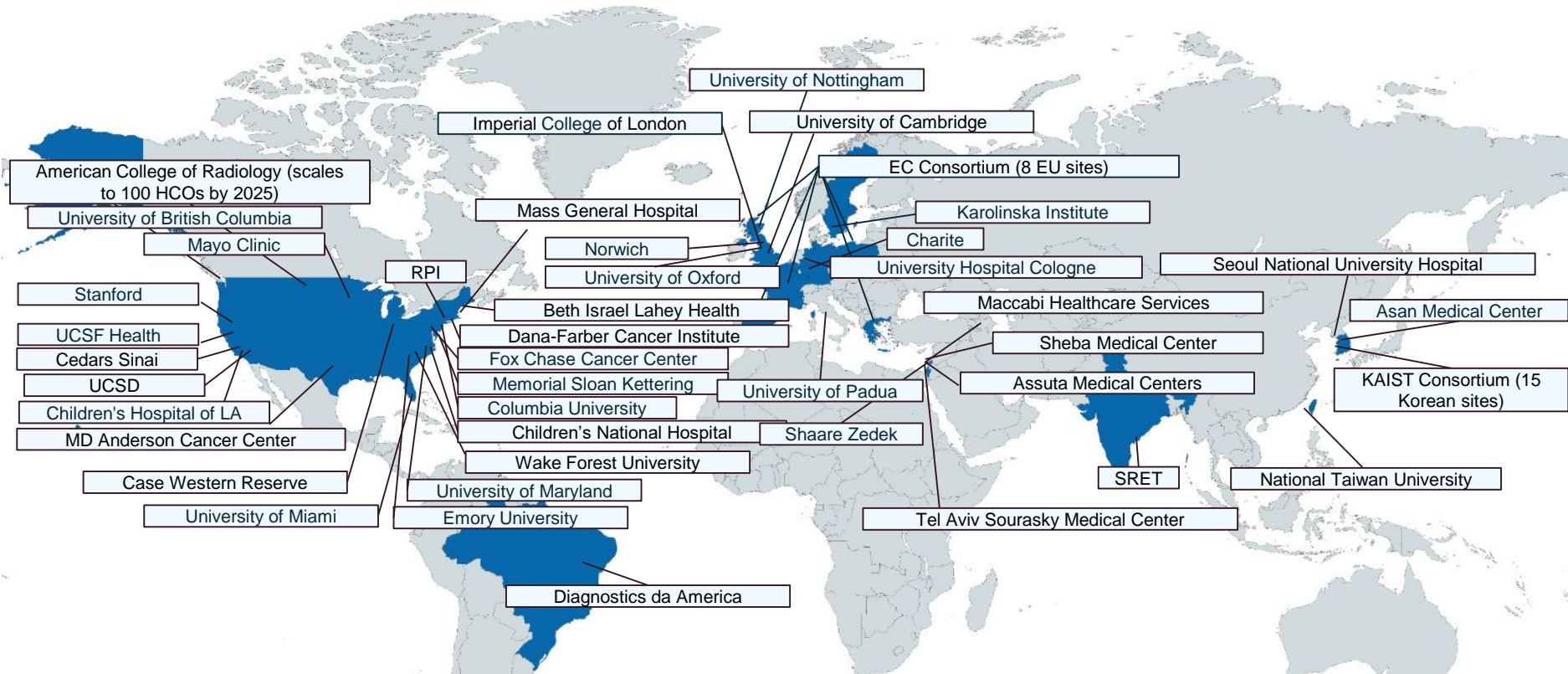3 Roth et al 2020. Link
4 Dayan et al 2021. Link
5 Venturebeat: Rhino Health emerges from stealth to bring hospital data to federated learning Link
6 Wu et al 2022 Link; Nalawade et al 2023 Link

We are established **network builders** and have the **fastest growing network** of sites around the world

American College of Radiology (scales to 100 HCOs by 2025)
University of British Columbia
Mayo Clinic
RPI
Stanford
UCSF Health
Cedars Sinai
UCSD
Children's Hospital of LA
MD Anderson Cancer Center
Case Western Reserve
University of Miami

Mass General Hospital
Norwich
University of Oxford
Beth Israel Lahey Health
Dana-Farber Cancer Institute
Fox Chase Cancer Center
Memorial Sloan Kettering
Columbia University
Children's National Hospital
Wake Forest University
University of Maryland
Emory University

Imperial College of London
University of Nottingham
University of Cambridge
EC Consortium (8 EU sites)
Karolinska Institute
Charite
University Hospital Cologne
Maccabi Healthcare Services
Sheba Medical Center
Assuta Medical Centers
University of Padua
Shaare Zedek
SRET
Tel Aviv Sourasky Medical Center

Seoul National University Hospital
Asan Medical Center
KAIST Consortium (15 Korean sites)
National Taiwan University

Diagnostics da America

Federated Computing enables the use of cutting - edge methods in healthcare data processing

Federated computing...

- Bring **GenAI** to sensitive health data

- Leverage **multi-modal** data from different data sources

- Maintain **"real-time" link** to source systems at scale

- Continuously **monitor and fine-tune** AI performance
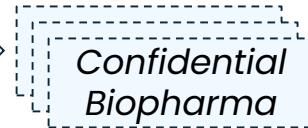
...unlocks high-value use cases

Large scale use of RWD for **regulatory review**[1]

Precision medicine and **early detection** of disease[2]

Efficient data registries for drug/device R&D[3]

Real-time data for **timely patient recruiting**[4]

ACR AMERICAN COLLEGE OF RADIOLOGY

NIH NATIONAL CANCER INSTITUTE Early Detection Research Network

European Commission

NRF National Research Foundation of Korea

Confidential Biopharma

TriNetX

1 Increasing Transparency in AI Model Performance and Reducing Time to Insights with Distributed Registries for a Prominent Medical Society Link
2 EDRN's Pancreatic Cancer Detection Teams With Rhino Health to Leverage Federated Learning In Order To Accelerate Research. Link
3 Global biopharma uses OCT Federated Dataset in drug discovery research Link
4 Accelerating clinical trial site selection with TriNetX Link

Thank you!