



E-BOOK

# PRIVACY-PRESERVING ANALYTICS FOR PHARMACEUTICALS

Using the LeapYear Platform and Differential Privacy to unlock value from sensitive data

## INTRODUCTION

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The competitive advantage of data and analytics is well-understood in the pharmaceutical space. However, success is not evenly distributed. Leading companies are breaking down organizational silos, accelerating innovation and discovery, and building sophisticated data partnerships. Other companies struggle to balance speed and efficiency against the security and compliance risks that must be managed when working with extremely sensitive data in a geographically distributed manner. This gap has widened as privacy laws and cross-border data access regulations proliferate across Europe and Asia. All pharmaceutical companies must find a way to meet regulatory obligations without sacrificing the business value that advanced data analytics can bring to R&D and commercial functions.

### USING LEAPYEAR, SEVERAL TOP PHARMACEUTICAL COMPANIES HAVE:

- opened up organization-wide visibility into existing data assets in every geography
- created new value from traditionally restricted, highly confidential datasets
- enabled analytics across internal silos, national borders, and third-parties
- evolved their technical infrastructure to support fully automated privacy by design

This eBook explains how breakthroughs in advanced cryptography are allowing enterprises to generate insights from sensitive datasets without exposing the underlying data. Today, organizations use LeapYear's technology to share and extract value from sensitive datasets while achieving automated privacy and compliance. Our platform is powering use cases including:

- [Enabling a multinational pharmaceutical company to instantly conduct analysis on data from across the world, without any data leaving its original jurisdiction](#)
- [Enabling a top-10 pharmaceutical company to simultaneously reduce privacy risk and time to data value](#)
- [Enabling access to new data sources from external institutions, enhancing the analytics capabilities of a pharmaceutical R&D team](#)

This eBook begins with an overview of the LeapYear privacy-preserving platform for reporting, analytics and machine learning. Then, it walks through three use cases for the pharmaceutical ecosystem - outlining the challenges created by various regulatory and internal data protection frameworks, and sharing how our customers overcome them to drive significant business value.

## THE LEAPYEAR PLATFORM

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LeapYear is the world's [first platform](#) for differentially private reporting, analytics and machine learning. The platform embeds mathematically proven privacy into every computation enabling analysts and data scientists to generate insights from data without exposing the data itself. The platform is based on the mathematical standard of [differential privacy](#), which enables companies to compute on data across business lines, geographic boundaries, and organizations while preserving locality, confidentiality, and value.

The platform provides several data and analytics benefits in pharmaceuticals including:

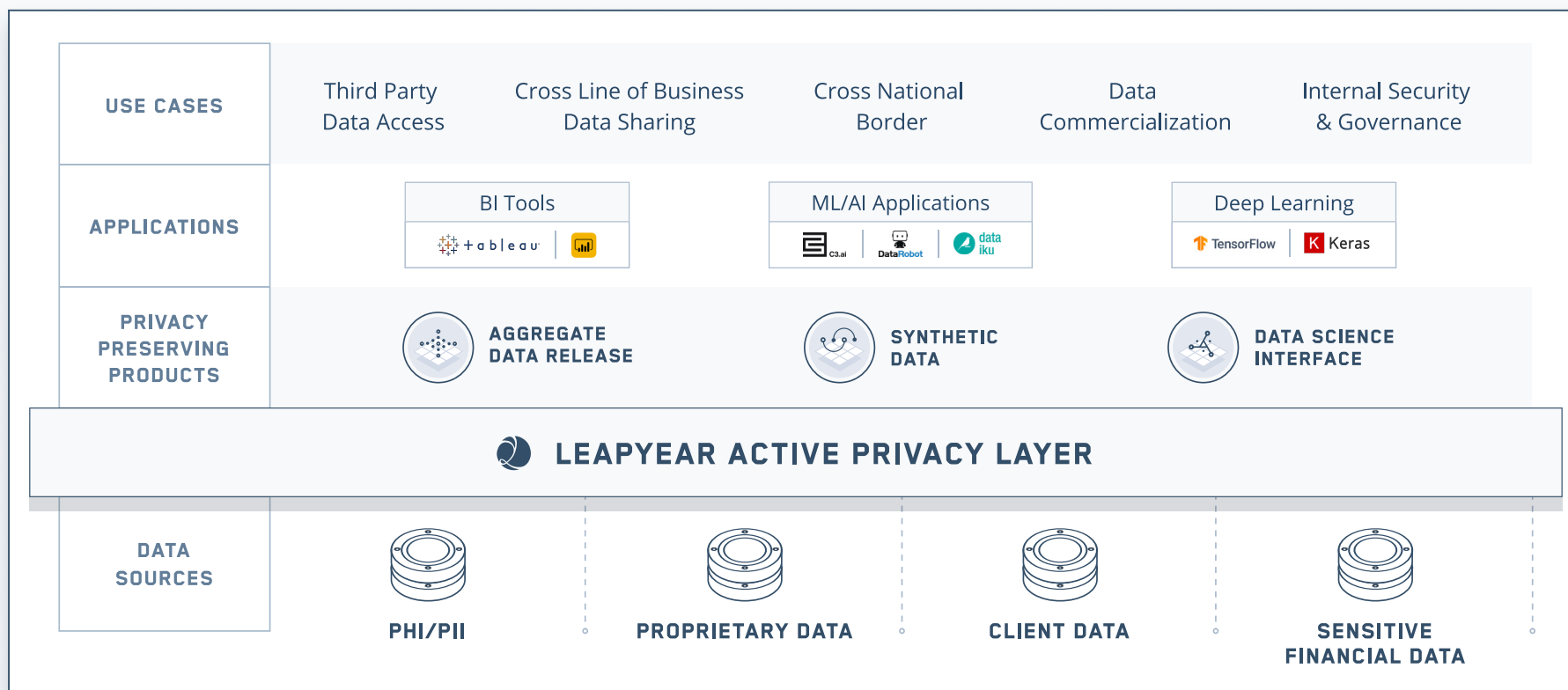
- **Broadening access to internal and third-party data**, by embedding privacy into every query and data operation.
- **Reducing privacy breach risks**, by ensuring data cannot be exfiltrated or subjected to privacy attacks.
- **Accelerating time to value** by automating privacy and governance.
- **Providing transparency on privacy risks from analytic queries** including tracking exposure budgets and logging all activities against a data set.

Unlike traditional approaches which use pre-defined rules to modify or redact information from a dataset, LeapYear’s platform dynamically introduces privacy based on the context of each computation. The ability to react dynamically to each computation eliminates the need to make assumptions about data use and dramatically simplifies data preparation and governance schemas.

LeapYear is designed to embed seamlessly into the analytics ecosystem, providing a privacy-preserving computational layer for applications across:

- Reporting and business intelligence
- Statistical analysis
- Application testing and development
- Data science and engineering
- AI, machine learning, and deep learning

LeapYear’s technology is based on decades of research and 100’s of academic papers, and has been evaluated by world experts in differential privacy and various privacy regulations, including HIPAA, GDPR, and CCPA. LeapYear is deployed in production, at multi-petabyte scale, across global 1000 financial institutions, healthcare companies, and insurers.

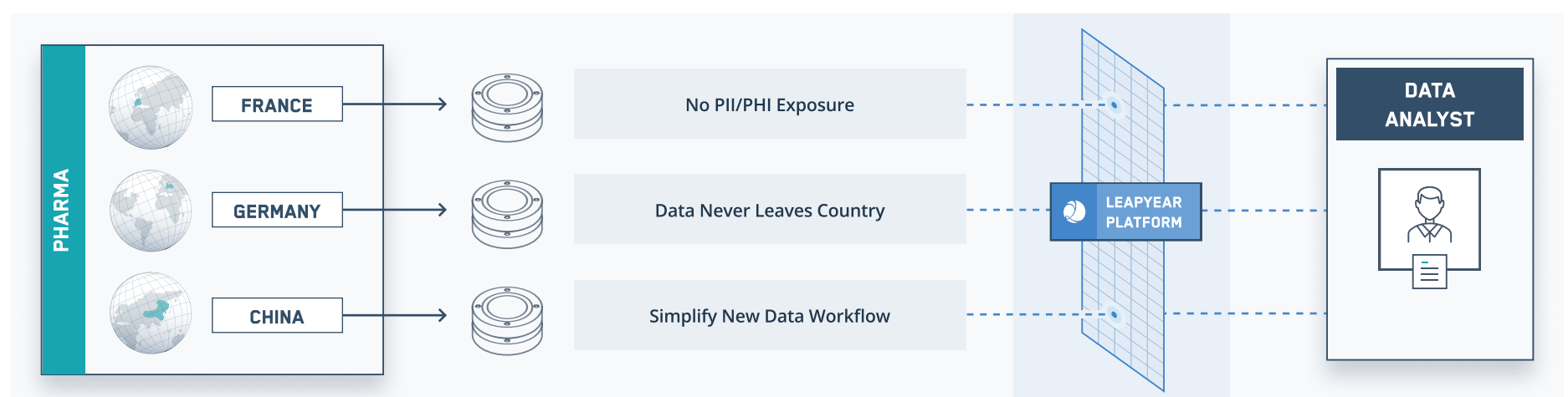


**USE CASE:**
**CROSS-BORDER DATA USE**

**VALUE PROPOSITION:** Increase efficiency of data use across national borders

**DESCRIPTION:** In recent years, severe restrictions on cross-border data usage have emerged, such as GDPR or Germany's Federal Data Protection Act. These regulations carry significant financial penalties, and the new systems and processes required for compliance introduce operational and capital inefficiency. LeapYear is being used by large multinational pharmaceutical companies to fundamentally change this paradigm and break down barriers to rapid drug development, testing, and release. This table and Figure 1 outline the core business challenges of using data across borders, and how LeapYear solves the problem.

CHALLENGE	CURRENT APPROACH	LEAPYEAR'S IMPACT
Staffing inefficiency	Duplicate teams in each country to analyze data.	<b>Analysts can reside anywhere</b> , and analyze data from any country without data crossing national boundaries.
Operational inefficiency	Replicate infrastructure in each country to analyze data.	<b>Process data from any jurisdiction or business unit</b> using centralized, privacy-preserving infrastructure.
Regulatory compliance	Implement complex field-level access controls, obfuscation, and lengthy approval processes. Alternatively, deny access to data outright.	<b>Compliance is simplified and enhanced.</b> Data cannot be viewed, extracted, or reconstructed, as rigorous privacy assurances are embedded into the platform.
Combining insights across organizational barriers	Analytics efforts remain siloed within countries or business units. Alternatively, aggregated datasets are shared, resulting in substantial privacy risk and loss of value.	<b>Build comprehensive and robust machine learning models</b> informed by data from all geographies.



**Figure 1:** LeapYear enables simple and efficient analytic access to data across borders, dramatically improving R&D cycle times and operational efficiency.

► **IMPACT:**

A top-5 European pharmaceutical company is leveraging data across national borders, including EU countries and China, to measurably shorten their R&D cycle and leverage global data for commercial purposes.

**USE CASE:**

**INTERNAL SECURITY AND EFFICIENCY**

**VALUE PROPOSITION:** Embed privacy into analytic tools, simplifying access to sensitive data and accelerating discovery and innovation.

**DESCRIPTION:** Compliance and privacy requirements have driven valuable data into deep silos within pharmaceutical organizations. Data governance and internal approval processes can introduce months of delay, or worse. Requests to access sensitive data are often denied outright, and when requests are granted, the information is at risk of being breached by the analyst.

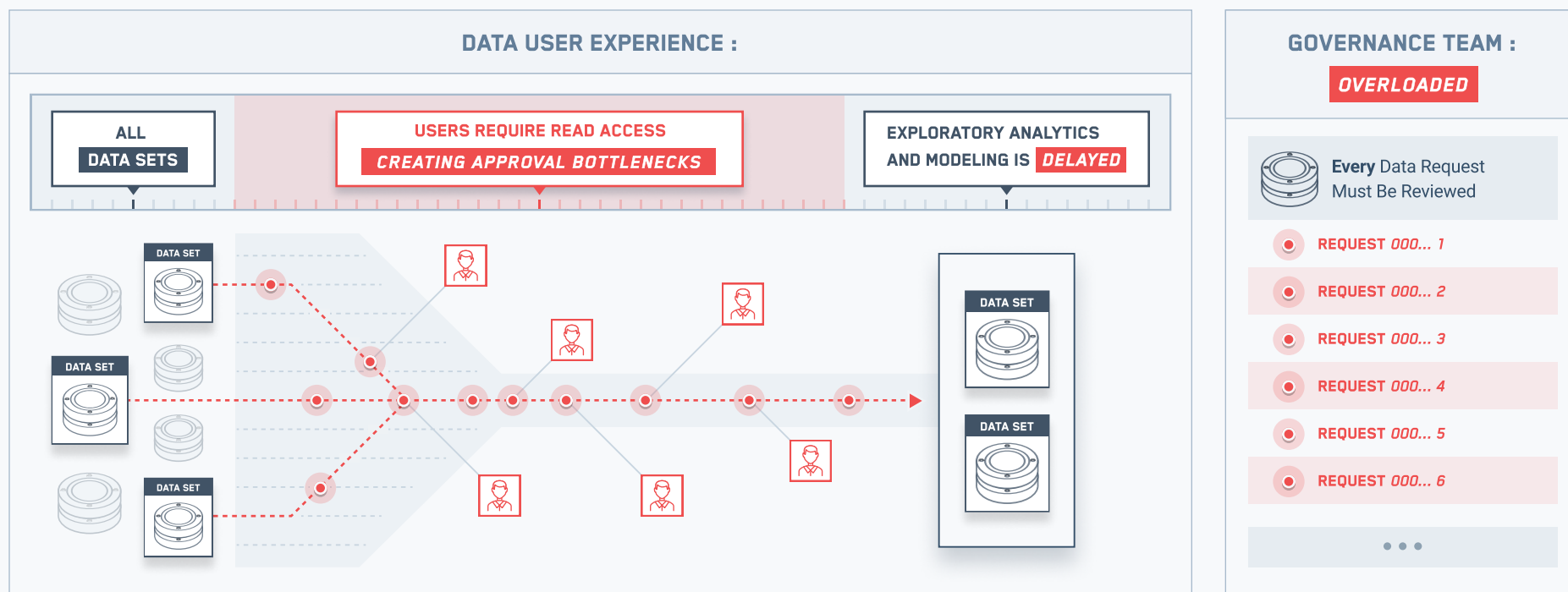
LeapYear delivers value for data governance teams, data consumers, and the organization at large:

- **Data governance operations are streamlined and enhanced.** Instead of making a set of high-risk decisions on each request for sensitive data, governance teams can confidently give authorized analysts access to query a privacy-preserving analytics layer. This addresses a large volume of data access requests, and allows governance teams to focus on priority issues.
- **Data scientists get access to more data, faster.** Analytics teams can now utilize sensitive data in their modeling and analysis. As discussed above, data from across organizational silos can be accessed instantly, improving the rate of exploration and discovery.
- **The organization can establish key building blocks of analytics strategy.** These include opening up visibility into existing information assets, deriving full value from these datasets, and embedding privacy and compliance into technical infrastructure.

► **IMPACT:**

A top-10 pharmaceutical company is achieving rapid prototyping and development of insights across their analytics organization by removing approval process bottlenecks.

**TRADITIONAL METHOD:** This pharmaceutical company implemented a typical data governance workflow. Each time an analyst wanted to analyze a dataset, governance approval was required prior to granting “read”-level access. This process, when multiplied over hundreds of analysts, and thousands of data sets, resulted in significant bottlenecks, slowing the pace of innovation. Not only was the governance team overwhelmed and frustrated, but granting direct read access also increases the risk of privacy breaches.

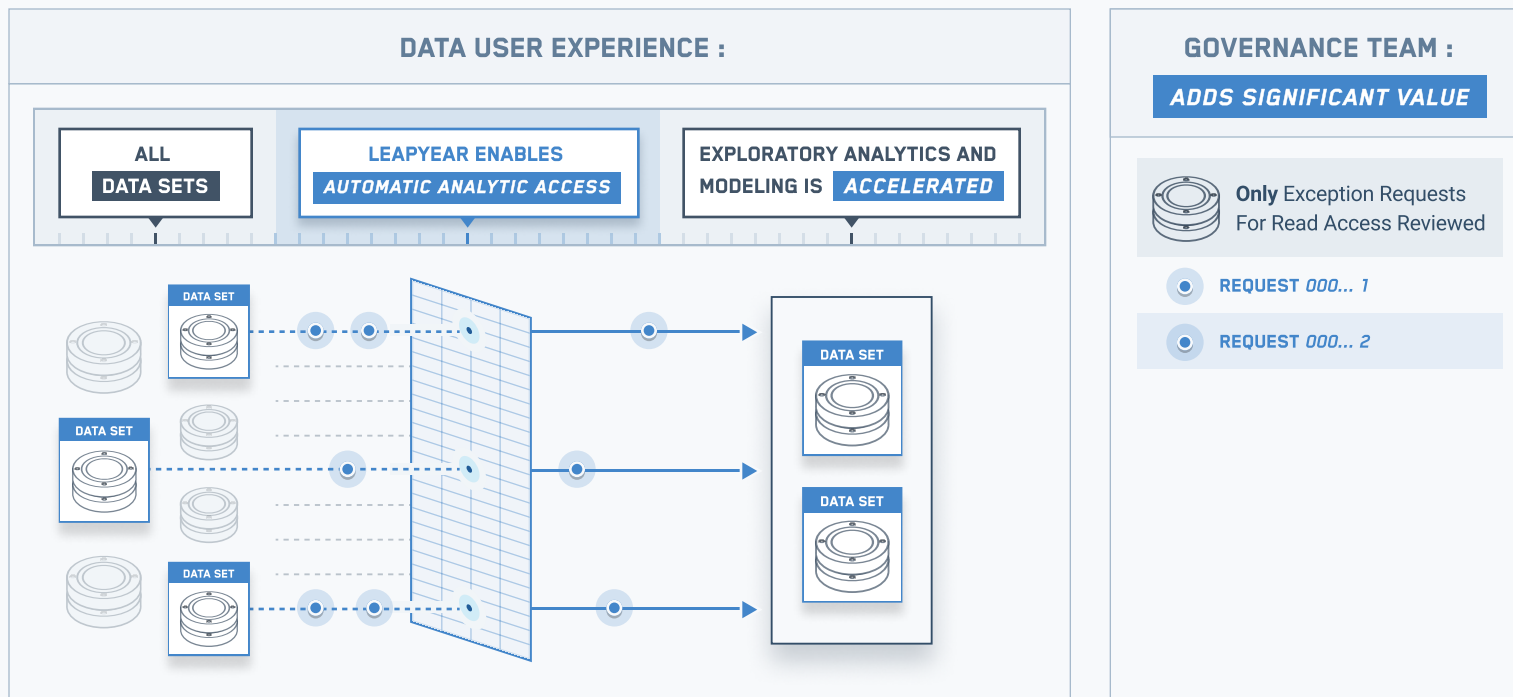


**Figure 2:** Requesting full read access to data sets causes bottlenecks in approval processes, limiting the pace of exploration and innovation.

**LEAPYEAR METHOD:** LeapYear’s privacy-preserving technology produces significant improvements in efficiency, scalability, and security. For example, analysts conducting initial investigations (e.g. browsing metadata catalogues, exploring datasets) are almost always interested in doing so at the cohort level, not at the level of individual people.

With LeapYear, governance teams can quickly grant privacy-preserving analytic access to explore, manipulate, analyze and model on highly sensitive datasets, without giving direct access to the data. For most use cases, analysts and data scientists derive valuable insights from data using LeapYear’s privacy-preserving and machine learning capabilities, and do not need further access to individual records. If a specific need for direct access to individual record-level data is subsequently established, governance teams can focus on these special requests, rather than manually reviewing every request for data.

BENEFITS FOR DATA SCIENTISTS	BENEFITS FOR GOVERNANCE TEAMS
Immediate access to sensitive data for analytics and modeling.	Substantially reduced privacy risks.
Analytical value can be derived from all data including sensitive fields.	Substantially reduced data exfiltration risks
Faster approvals for record level access when needed.	Fewer access requests to process and manage.



**Figure 3:** Enabling analytic access through LeapYear removes the approval process bottleneck and reduces organizational privacy risks.

## USE CASE: THIRD-PARTY DATA ACCESS

Augmenting proprietary datasets with third-party data is an exciting and much-discussed trend. For instance, incorporating real-world evidence from hospitals and research institutes can significantly improve development and commercialization of new treatments and therapies.

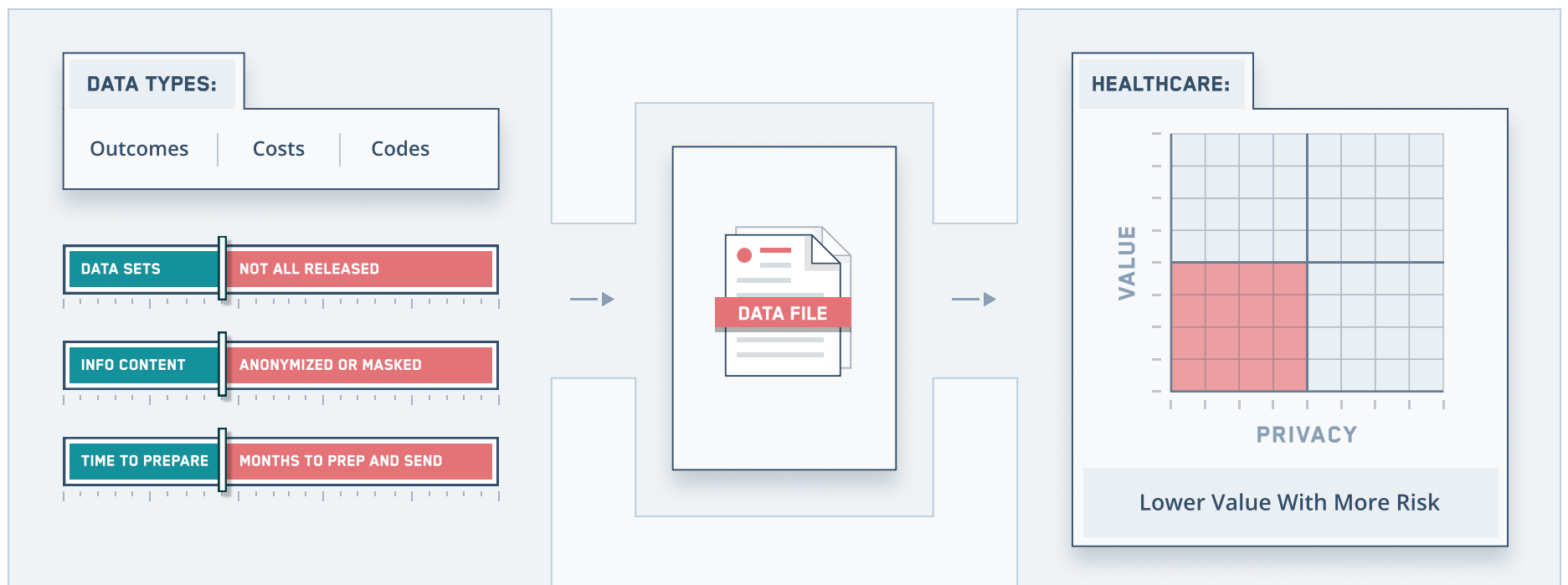
Despite this potential, few concrete success stories exist. From our conversations with senior executives across life sciences and healthcare, we believe that data sharing arrangements have failed to gain broad traction for the following three reasons:

- 1. Issues of control** - Even with strong contractual protections, data owners are not willing to ship sensitive data to other parties, as this represents a near-total loss of visibility into who is accessing this data, and what it is being used for.
- 2. Available datasets aren't compelling** - Traditionally, any data that is shared with third parties must be aggregated or anonymized prior to release. This is a long and costly process that runs counter to the data consumer's aim of receiving rich and real-time data flows. Aggregates simply do not contain the same potential for insights as granular patient profiles and lab results.
- 3. Reputational and regulatory barriers** - If the data consumer mishandles protected health information, the data owner can expect damaging loss of public trust and severe regulatory consequences. Anonymization or aggregation is insufficient to protect privacy, as has been shown by multiple breaches of healthcare data.

LeapYear's clients have access to next-generation technology that solves for these entrenched barriers, and permits a broad re-thinking of data strategy and data access paradigms.

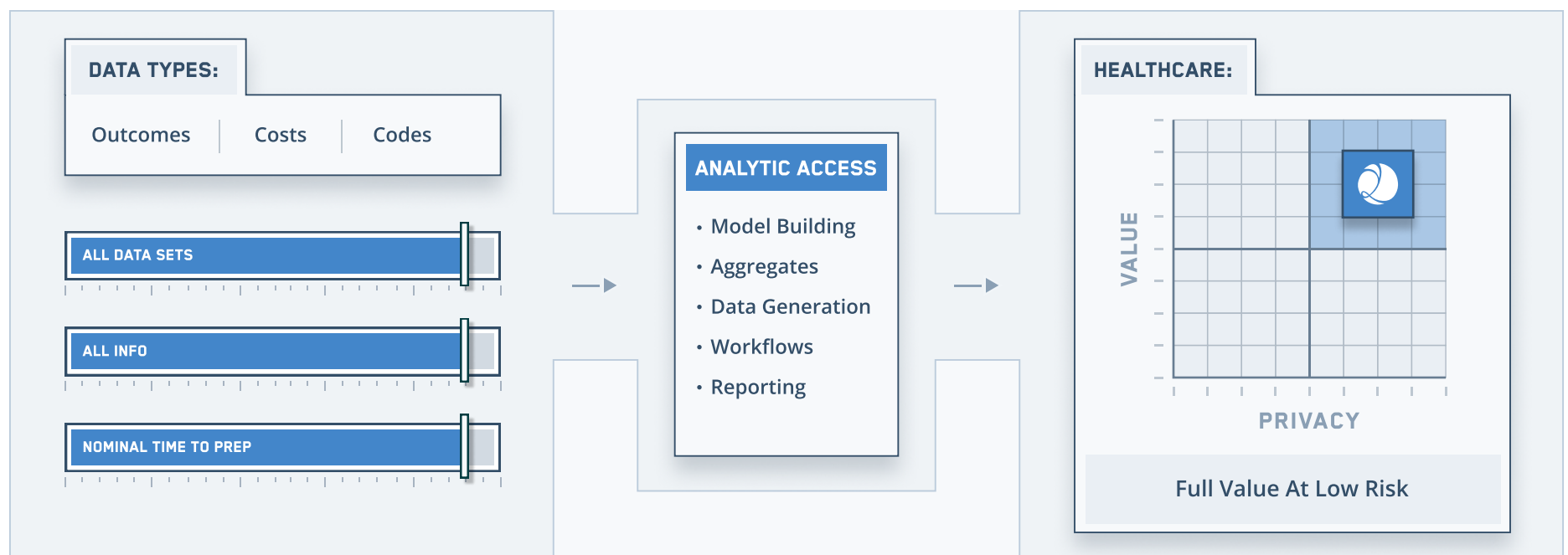
► **IMPACT:**

- LeapYear is working with multiple healthcare companies to enable 25% of the US population's medical information to be shared externally for quantifying the effectiveness of drugs and therapies.
- Prior to partnering with LeapYear, these organizations shared no data at all, or shared only a limited version of the data to select partners.
- For one top healthcare company, LeapYear's system is running at petabyte scale, protecting data on hundreds of millions of users, enabling the technology company to share analytic access to patient data with over 50 partners.
- Insights are now available from previously inaccessible data, all while substantially enhancing privacy & security and maintaining compliance.





LeapYear changes this paradigm, providing turn-key solutions to support and simplify data sharing. Organizations move from low value, high risk data models to high value, low risk ones.



## SUMMARY

The challenges around extracting value from sensitive data are diverse and high-stakes. However, by advancing the following three initiatives, pharmaceutical companies are staking out first-mover advantages, and safely capturing the full range of benefits promised by data and advanced analytics:

- Accelerating innovation by breaking down data silos
- Eliminating risk with fully automated privacy by design
- Maximize strategic outcomes by leveraging third party data

If you'd like to talk with one of our pharmaceutical focused solutions architects, please fill in a contact request and [indicate your interest](#) to discuss the details of this eBook.

## RELATED ARTICLES AND INFORMATION

- [“What is differential privacy, and why is it needed”](#) - Blog by Aaron Roth, Chief Scientific Advisor at LeapYear & Associate Professor at University of Pennsylvania
- [“Differential privacy from theory to practice”](#) - Blog by Ishaan Nerurkar, CEO of LeapYear Technologies
- [“Privacy-preserving analytics - A primer for the Chief Data Officer”](#) - an eBook by LeapYear Technologies