



CC-IT-01 Integrated Reportable Disease Data Management System

- \$10 Million in Capital Construction Funds-IT to implement and validate automated disease reporting processes and data management systems, as a replacement for the Colorado Electronic Disease Reporting System (CEDRS) and other data management systems utilized by the Department



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Overview

- DCEED is integral to the COVID-19 response.
- The Colorado Electronic Disease Reporting System (CEDRS) is the system-of-record for patient event data and disease records for ~80 conditions tracked by CDPHE.
- Thousands of lab test results flow into CEDRS daily.
- Contact information for patients eligible for COVID-19 case investigation flow out of CEDRS and into our Case Investigation and Contact Tracing application, Dr. Justina.



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CEDRS Background

- Home-built system
- Last iteration in 2017
- Collaboration between the Office of Information Technology; the CDPHE Communicable Disease branch; and the CDPHE Public Health Informatics, Reporting and Refugee (PHIRR) branch
- In-house ownership enables flexibility in and control over changes and ongoing maintenance
- Used by all Local Public Health Departments
- Does not include COVID contact tracing/investigation or outbreak management



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Project: CEDRS Partial System Replacement

Goal: Build a solid technology foundation and IT change management framework, optimized for managing disease reporting *data* as a critical business asset.

Strategy: Reduce technical debt and design data for sharing and governance.

Scope:

- Product planning.
- System architecture and design.
- Infrastructure provisioning and validation.
- Quality assurance surveillance planning processes and tools procurement.
- Systems integration processes and tools provisioning.
- Data conversion and interface deliverables.

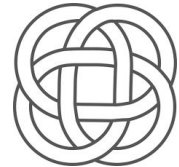


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Long-Standing CEDRS Risks & Issues

Before COVID-19, the following factors added risk to DCEED's ability to respond to emerging public health emergencies.

- **Outdated technology stack** → *Performance and stability risks*
 - MS SQL Server 2012 (end-of-life'd once, extended to 2022).
 - MS Unified Access Gateway (out of support now for years).
 - Servers at eFort (vs cloud) result in scalability limitations.
- **Tightly coupled architecture** → *Limited extensibility & integrations*
 - Presentation layer built on .Net forms.
 - No application programming interface (API).
- **Insufficient data management policies and playbook** → *Data bloat*
 - No archiving solution for old records (20+ year-old data).
 - Duplicate data creeps in daily.

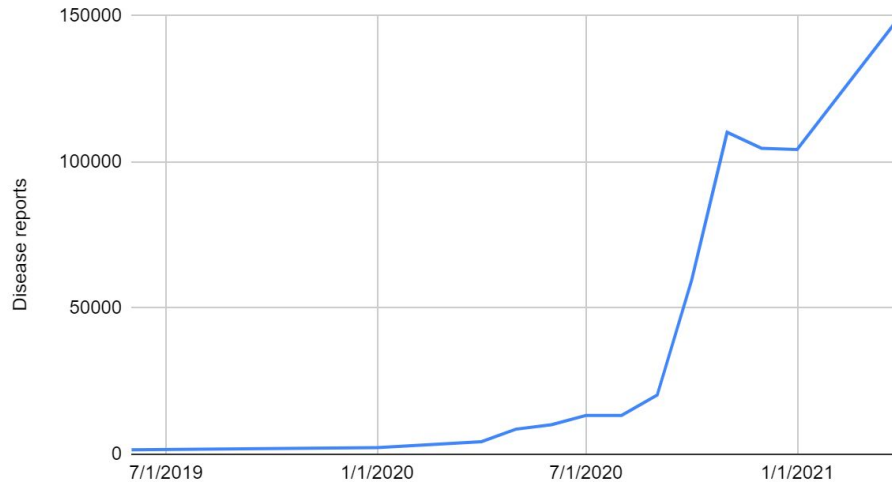




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Under COVID-19 Strain: CEDRS Risks & Issues

CEDRS Avg Daily Disease Reports

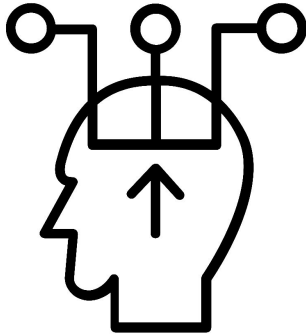


- **Fragmented data management** → *Inability to provide a timely and complete picture of COVID-19.*
- **Technical debt and lack of abstraction layers** → *New integrations and changes negatively impact performance and data integrity.*
- **No load/stress testing** → *Inability to predict breaking point and mitigate scalability constraints.*



CEDRS Risks & Issues: Lessons Learned

Without a data roadmap, governance, playbook, and modern architecture ...

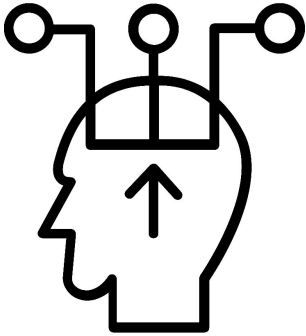


- Data integrity requires manual labor.
- Integrations with other critical systems in the disease reporting pipeline (e.g., ELR, Dr. Justina) propagate and compound data quality issues.
- Performance issues snowball.
- Pulling data out of CEDRS is tedious and cumbersome.



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IT Industry: Lessons Learned and Modern Practices



- Data collected for one use case is often re-used for analysis against multiple, other hypotheses.
- To protect and manage data as a business asset, data needs to be *loosely* coupled with user functionality.
- API-led design allows for functional extensibility and context-specific data transformation, while ensuring core data security and integrity.
- API-led connectivity reduces the IT workload over time.



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CEDRS Replacement Project



Document the current data blueprint (source, flows, relationships, and access patterns) in order to map how changes to CEDRS data structures and access would impact system functionality and integrations.



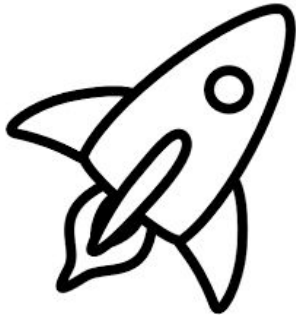
Redirect data access through a new layer of abstraction (APIs), which will perform the necessary data transformation to insulate out-of-scope system functionality and integrations from in-scope data changes and ensure protection of sensitive information (e.g., ePHI).



Establish target data management technology and data structures; institute new data standards, policies, and mechanisms (e.g., security, performance, recoverability, integrity and validation, monitoring); and migrate.



Outcome: CEDRS Future



With a solid foundation of modern technology, software development and change management practices, and data health and governance, the cost and risk of extending CEDRS further (e.g., functionality, use cases, integrations, scalability) is much reduced.

Future system extensions or replacements can be ...

- Made incrementally and efficiently.
- Scoped to match funding opportunities or change windows.
- Awarded to one or more vendors.
- Isolated from cascading impacts or parallel development initiatives.