

Information System Architecture of the Lithuanian National Biobanking Infrastructure

Justas TRINKŪNAS¹, Roma PURONAITĖ^{2,3}, Laurent JACOTOT⁴, Mike WOODWARD⁴, Mindaugas MORKŪNAS²

INTRO

- In 2019, the Human Biological Resource Center (HBRC) project was initiated in Lithuania to establish a modern biobanking infrastructure and join the BBMRI-ERIC network.
- This national initiative aims to standardize and centralize collecting, processing, storing, and managing biological samples and related health information, fostering collaboration among various institutions to support health research and public health initiatives.
- In 2024, Lithuania became a full member of the BBMRI-ERIC.

GOALS

- Establish a HBRC with a unified and standardized system for managing biological samples and associated health data.
- Foster collaboration among major Lithuanian health institutions, including Vilnius University Hospital Santaros Klinikos (VULSK), National Center of Pathology (VPC), National Cancer Institute (NCI), and others, to support health research and public health.
- Enable the development of personalized medicine by linking high-quality, well-annotated biospecimen collections with clinical data.
- Overcome operational inconsistencies across Lithuanian biobanks by creating a cohesive biobanking network to ensure better accessibility of samples and data.

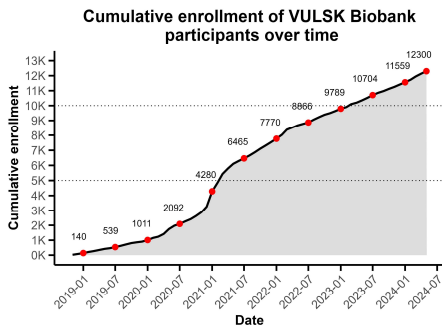


Fig. 1. Cumulative number of enrollment.

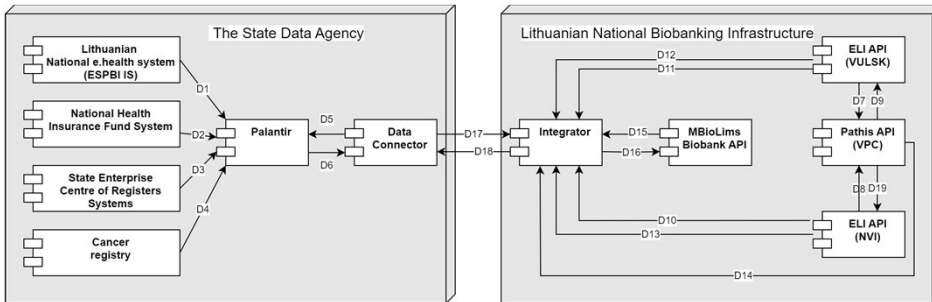


Fig. 2. Lithuanian National Biobanking Infrastructure

ARCHITECTURE

This system integrates three main components (Fig. 2):

- Hospital infrastructure:** integration of the hospital information systems (HIS) from key institutions, such as VULSK, NCI, and VPC.
- Biobank laboratories and storage:** implementation of a unified biobanking and storage system using Modul-Bio's MBioLIMS BioBanking Software platform.
- Information technology infrastructure:** integration of networking operations through a centralized IT system that includes a biobank participant registry, hospital information system (HIS) integration, and State Data Agency connections.

CASE OF VULSK BIOBANK

- In this feasibility study, we examine a VULSK biobank with 12.3K patients enrolled by June 1, 2024 (Fig. 1, Fig. 3).
- The database contained over 101.5K inpatient, 823.2K outpatient, and 6.2K emergency encounters, along with 120K DICOM images (mostly US, CR, and CT modalities, Fig. 4).
- Patients primarily had cancer and blood diseases, infections, and other diseases (Fig. 5).

DISCUSSION

A case study of the VULSK biobank demonstrates the robust data connectivity and seamless accessibility of the implemented National biobanking information system. Future developments will focus on expanding the network, integrating AI analytics, and integrating with international federated systems.

Municipality-wise distribution of VULSK Biobank participants by place of residence

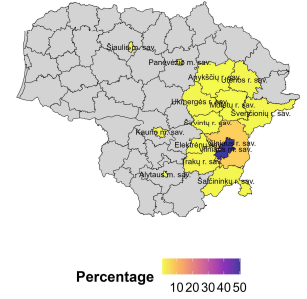


Fig. 3. Percentage distribution by municipalities.

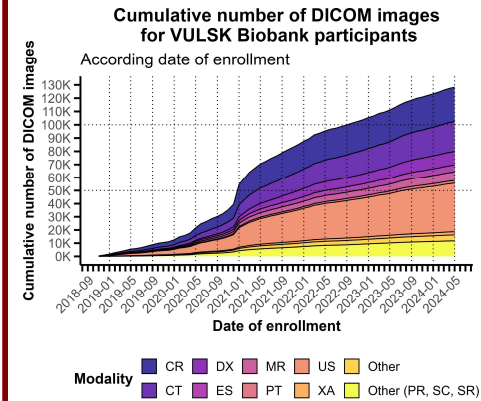


Fig. 4. Cumulative number of DICOM images.

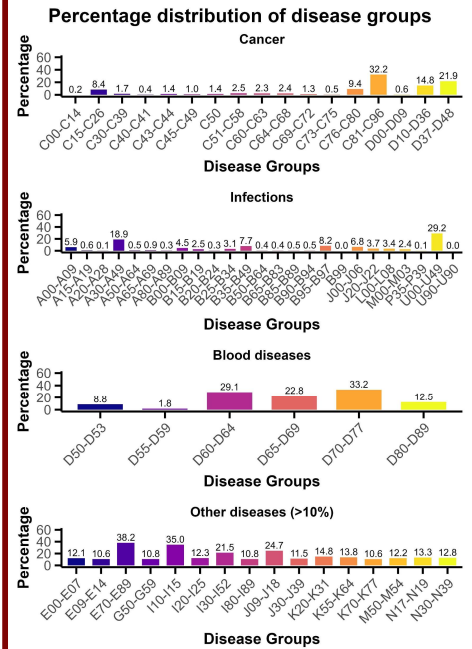


Fig. 5. Percentage distribution by disease: (A) Cancer and blood diseases, (C) Infections, (D) Other frequent diseases.

¹ Vilnius Gediminas Technical University
² Vilnius University Hospital Santaros klinikos
³ Institute of Data Science and Digital Technologies Vilnius University
⁴ Modul-Bio, info@modul-bio.com

