Mass General Brigham

2025 Newsletter

Mass General Brigham Biobank

160,000 participants

1.3 million stored biosamples

260,000 distributed biosamples

625 studies and 425 scientific papers

2025 retrospective for the Mass General Brigham Biobank

Thank you for your continued participation in the Mass General Brigham Biobank (Biobank). The Biobank provides biosamples and data to researchers. More than 160,000 patients have joined this research program, which is at the forefront of medical discovery across our hospitals.

This year, the Biobank started sharing metabolomic data with researchers. Metabolomic data measures small molecules that are made or used by the body (like proteins or sugars) for key processes like energy production. Researchers use metabolomic data to better understand how the body works and how it responds to disease.

We also started returning to participants a new type of result, which is a biomarker that indicates a high risk for getting multiple myeloma. This work is described below.

Finally, we inventoried 425 articles, all published in peer-reviewed scientific journals, that credit the Biobank for biosamples and/or data. Each one of these describes research findings that were made possible by the Biobank. It is exciting to find so many cases of the Biobank's impact.

Returning biomarker results on multiple myeloma

Since 2016, the MGB Biobank has been returning genetic results to participants when these results are medically actionable. Medically actionable means that there are defined next steps that participants can take with the support of their clinical care team. Starting in 2025, the Biobank is now returning a biomarker result, too. A biomarker is a molecule found in the body, like a protein. The Biobank has partnered with Irene Ghobrial, MD, a medical oncologist and cancer researcher at Dana-Farber Cancer Institute and Brigham and Women's Hospital (BWH). Together, we will return a biomarker result that is associated with a high risk of developing multiple myeloma, a type of blood cancer.

Before patients are diagnosed with multiple myeloma, there are early stages of the cancer that typically have no symptoms. These early stages are called monoclonal gammopathy of undetermined significance (MGUS) and smoldering multiple myeloma (SMM). When someone has MGUS or SMM, they do not have cancer but have an increased risk of developing multiple myeloma in their lifetime. Dr. Ghobrial looks for biomarkers in the blood to see if someone has one of these early-stage conditions. In close partnership with the Biobank team, Dr. Ghobrial and her team will be returning MGUS and SMM results to a subset of Biobank participants when these results indicate a high risk of developing multiple myeloma.

Dr. Ghobrial's work aims to improve the way we diagnose multiple myeloma. In particular, her work hopes to improve diagnosis and standards of care for Black patients. Multiple myeloma is much more common in Black individuals, though the reasons why remain unclear.

As with any cancer, early detection can help drive better health outcomes. Often, multiple myeloma is difficult to diagnose until the disease has already progressed. Dr. Ghobrial believes that routine screening, especially for people who are at high-risk for multiple myeloma, could significantly improve survival rates. Our hope is that the Biobank's program to return biomarker results on multiple myeloma will help patients get care sooner, improving health outcomes and quality of life.

Using biomarkers to determine biological age

The way that we age is influenced by many factors. These include metabolism, genes, environment, and lifestyle. Biological age measures how old your body appears to be based on these factors, and it differs from chronological age. A person may be chronologically older than another but may be biologically younger than them. This can even vary across different organs in the same person. For example, a person with dementia may have a brain that is biologically older than other parts of their body. Stresses caused by acute disease can even show a reversal of biological age upon recovery. Accurate knowledge of biological age is important to deliver optimal patient care.

Vadim Gladyshev, PhD, is a Professor of Medicine at Harvard Medical School and the Director of the BWH Center for Redox Medicine. Dr. Gladyshev's research helps us better understand the complex topic of aging. Much of his work is concerned with modeling biological age using what is called multi-omics. Multi-omics involves the study of biological markers in the body, called biomarkers. Multi-omics incorporates several 'omics' data types, including genomics, metabolomics, epigenetics, proteomics, and transcriptomics. For example, genomics looks at all of a person's genes to get a sense of how their body works. Proteomics looks at the proteins created in the body. Metabolomics looks at a person's metabolism. Multi-omics combines all this information to create a detailed picture of a person's health.

Biobanks contain large numbers of biosamples that can be analyzed to generate multi-omic data. This data enables researchers to model biological age and thus better understand the mechanism of aging. Starting with roughly 500 Biobank samples, Dr. Gladyshev and his team profiled multi-omic data to create one of their aging models. These models of age are greatly improved when they can use a lot of data. Dr. Gladyshev's work also helps to verify other aging models.

Biological age tells us many things that chronological age cannot. Dr. Gladyshev's work tracks how disease and stress affect our bodies, which can lead to more personalized medical care. It allows for better risk prediction and understanding of how diseases impact people. Further work to validate these findings will allow for more clinical uses. Understanding aging in detail is critical for improving healthcare in an aging population.

Study highlights

Identifying biomarkers of radiation responses

Many cancer patients receive radiation therapy, but tumors differ in how they respond to radiation and side effects can vary. Current radiation exposure tests are slow and costly. Dr. David Kozono is the Director of Thoracic Radiation Oncology at BWH. His team looked at MGB Biobank samples from patients receiving radiation therapy. They identified serum micro RNAs, which are molecules found in the blood, that correlate with the amounts of radiation a person has received. These results could allow for the creation of fast and cheap tests for radiation exposure, which could be used to guide treatment for people who are accidentally exposed to radiation, or to tailor therapy.

Detecting prostate cancer with polygenic risk scores

A team led by Adam Kibel, MD, the Chair of the Department of Urology at Mass General Brigham, explored new tools for detecting cases of prostate cancer. His team found that combining a polygenic risk score (PRS), which reflects genetic risk based on 451 genetic variants, with multi-parametric magnetic resonance imaging (mpMRI) helped improve detection of cancer. They investigated 1,243 men who have genomic data in the Biobank and have had an mpMRI scan at MGB. They found that men with the highest genetic risk were more likely to have significant prostate cancer. By using this genetic score along with mpMRI, doctors could reduce the chances of missing serious cancer cases, potentially improving early detection and treatment. These intriguing preliminary results have led to a new study of 1,500 men to prove that genomic data with MRI can find prostate cancer. Dr. Kibel is reaching out to Biobank participants to invite them into this new study.

Cardiovascular risk factors in anxiety and depression

Research led by Dr. Ahmed Tawakol, a cardiologist at Massachusetts General Hospital, has linked stress-related disorders and cardiovascular disease (CVD). Stress-linked disorders, such as anxiety and depression, affect millions of Americans. These mental health conditions accelerate the gain of risk factors and increase CVD risk. The MGB Biobank, a resource for long-term health data, enables these large-scale studies to happen. Ongoing research, including genetic risk scores and biomarkers, may offer insights into new care and treatment.