

Translating Precision Medicine into Global Impact

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(on behalf of)

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Chief Medical and Scientific Officer



NASEM Workshop - Precision Medicine: Promoting Knowledge Exchange & Collaboration
Between Kuwait and the United States – October 16, 2025



77th Anniversary Framingham Heart Study



Factors of Risk in the Development of Coronary Heart Disease— Six-Year Follow-up Experience

The Framingham Study

WILLIAM B. KANNEL, M.D., THOMAS R. DAWBER, M.D., F.A.C.P.,
ABRAHAM KAGAN, M.D., F.A.C.P., NICHOLAS REVOTSKIE, M.D.,
AND JOSEPH STOKES, III, M.D.
Framingham, Massachusetts

INCREASINGLY RELIABLE ESTIMATES of the prevalence and incidence of coronary heart disease (CHD) emphasize the importance of this disease as a contemporary health hazard. Cardiovascular disease is now the leading cause of death in the United States. The prevalence of coronary heart disease is increasing in all heart age groups. In the diagnosis of CHD, the past decade, no significant progress has been made. This slight increase in incidence which has been observed in the past decades, which has been substantiated by the fact that because of its manifestation as "silent" infarction, mortality in hospital is still the best therapeutic preventive measure.

Received for
From the
Framingham
Institute, National
Heart Institute, U. S.
Department of Health,
Education, and Welfare,
Presented at the
The American Heart Association
1961, Boston, Mass.
Requests for
Thomas R. Dawber,
Director, Heart Dis-
ease Prevention, Fram-
ingham, Mass.

Since it has been established that coronary atherosclerosis is present for many years prior to the development of symptomatic CHD, it seems evident that efforts at prevention must begin many years before the onset of clinical disease.

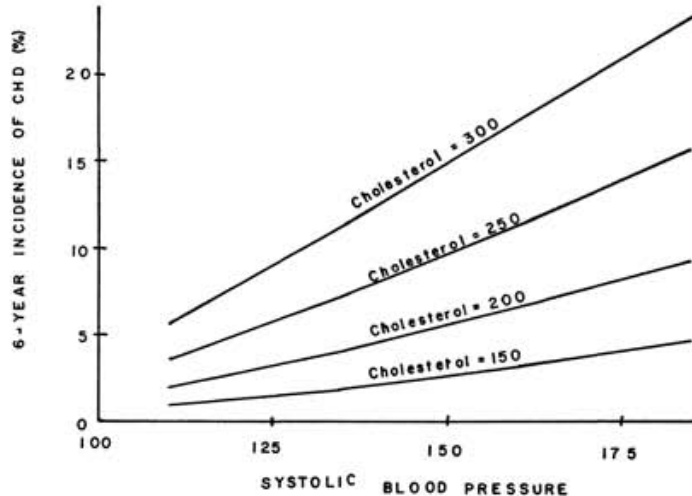


FIGURE 2. Six-year incidence of coronary heart disease according to level of systolic blood pressure at specified serum cholesterol levels (men 45 to 62 years). For explanation, see legends for Figure 1.

Enrolled 5,209 men and women in 1948

Some Framingham early discoveries:

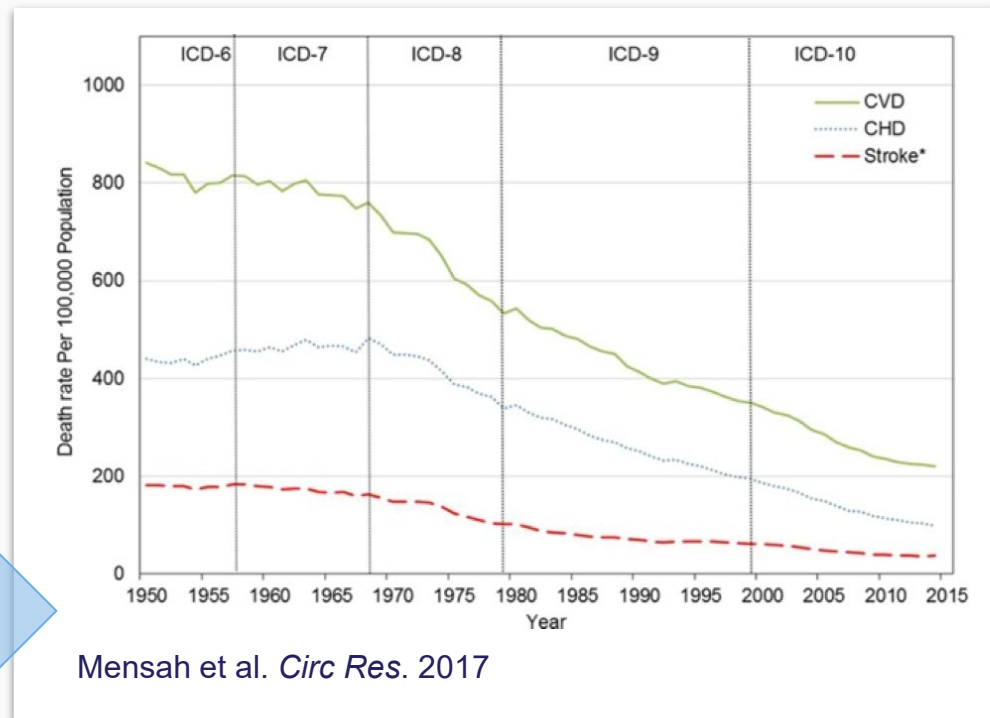
- 1960 – Cigarettes increase heart disease
- 1961 – cholesterol, blood pressure increase heart disease
- 1967 – exercise decreases risk of heart disease; obesity increases it
- 1970 – high blood pressure and atrial fibrillation cause stroke

The Opportunity for Large Cohort Studies and Public Health

The impact of Framingham (and similar cohorts) has been dramatic

From 1950 - 1996: Heart disease mortality fell 56%, stroke rates fell by 70%

Since 1990, heart disease mortality has continued to fall by 22%

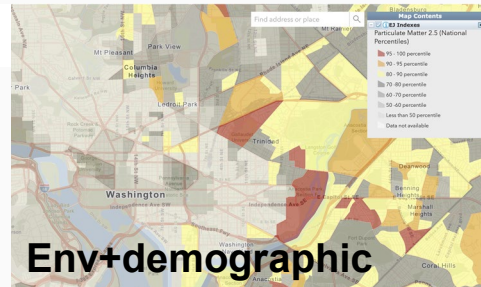
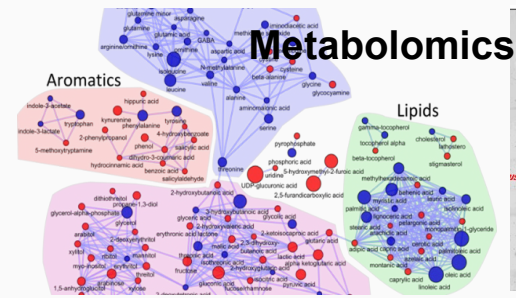
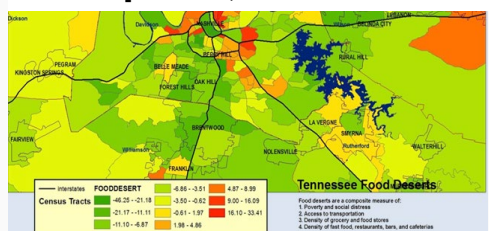


Understanding Enabling Individualized Health Requires Multimodal Data Over Time

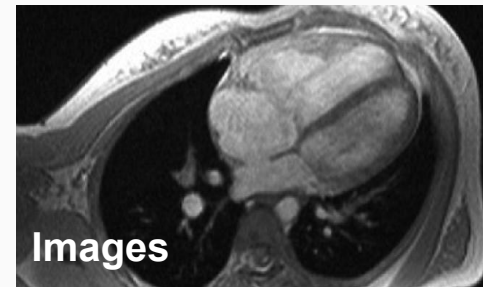
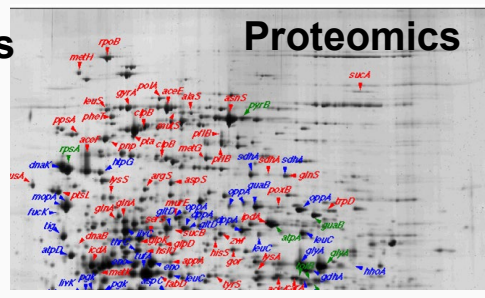
Survey instruments & exams

Digital Health

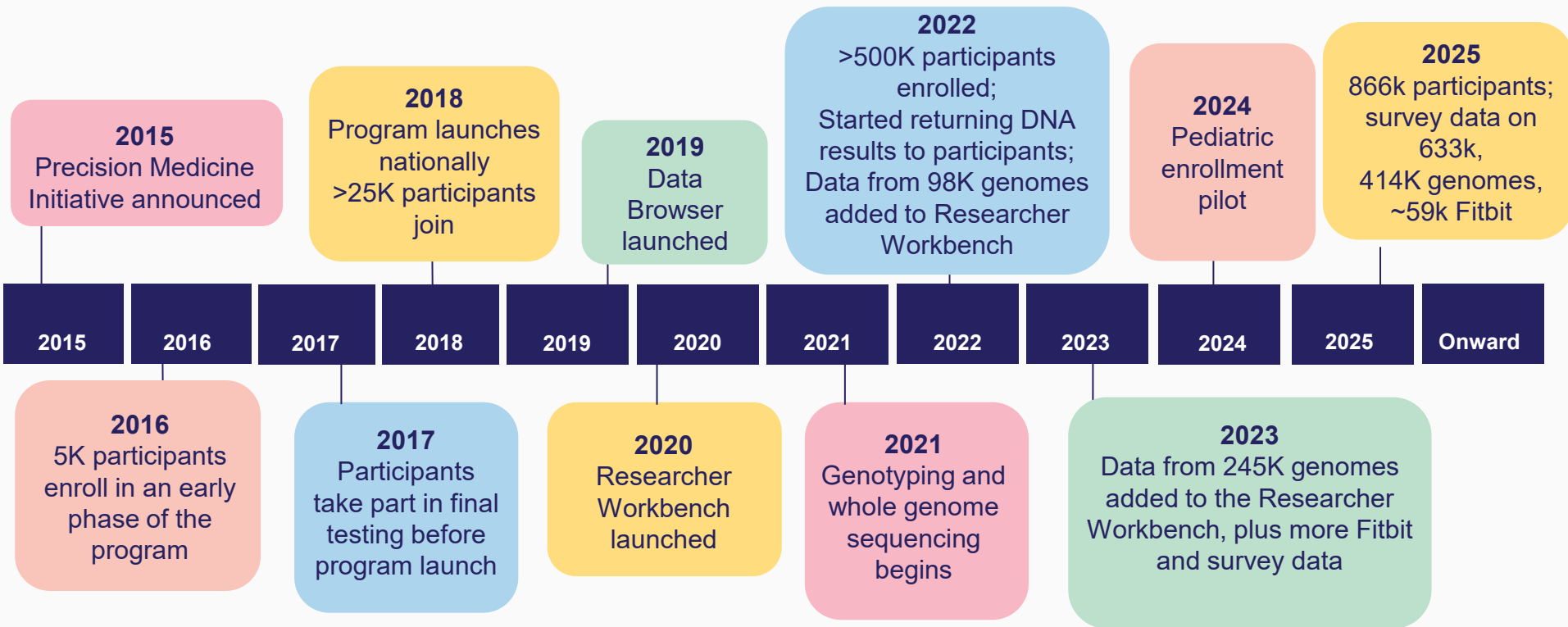
Geospatial, food deserts



The screenshot shows the McAfee ePO console interface. At the top, there's a navigation bar with 'Home', 'Tools', 'Reports', 'Admin', and 'Help'. Below this, the main content area is divided into several sections. On the left, there's a sidebar with 'Active Problems' and 'Active Alerts'. The main area is titled 'Health records' and contains a table with columns for 'Component', 'Status', and 'Last Update'. The table lists various components like 'Anti-Virus engine', 'Anti-Malware engine', and 'Anti-Spyware engine', along with their status and the last update time. On the right side, there's a 'Summary' section with a table showing the number of records for each status (e.g., 'All records', 'Failed', 'Success').



Timeline of the *All of Us* Research Program



Enrolled 867K+ Participants With Continued Growth

Participant Enrollment

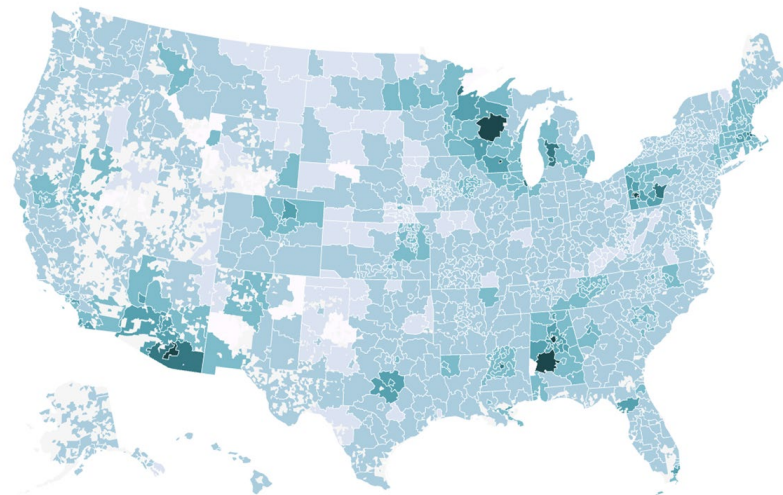
867,000+
Participants

472,000+
Electronic
Health Records

596,000+
Participants who
have completed
initial steps of the
program

610,000+
Biosamples

Map of Consented Participants



US map of *All of Us* participant density; covers
98.1% of US zip3 codes

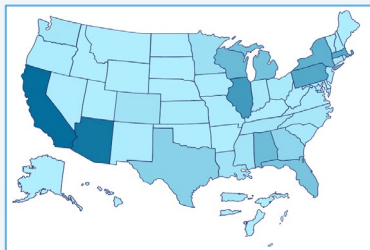
The *All of Us* Research Program: Accelerating Health Research and Medical Breakthroughs, Enabling Individualized Prevention, Treatment, and Care for All

What Goes in...



Data from **867,000+** Participants from all 50 states including:

602,000+ Biosamples
467,000+ EHRs
1,958,500+ Survey Responses



Gets Combined & Curated...



Data Refinements



Cloud-based Platform

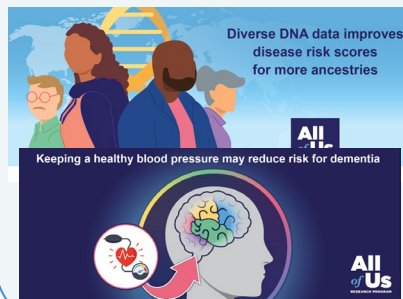
For harmonization,
participant privacy, and
quality

Leading to New Research...

From **16,000+** Registered Researchers from **1,120+** Organizations



750+ Publications using *All of Us* Data, such as:



And Valuable Health Information Returned to Participants



700,000+ Individual DNA Results Returned to **228,000+** Participants, including:

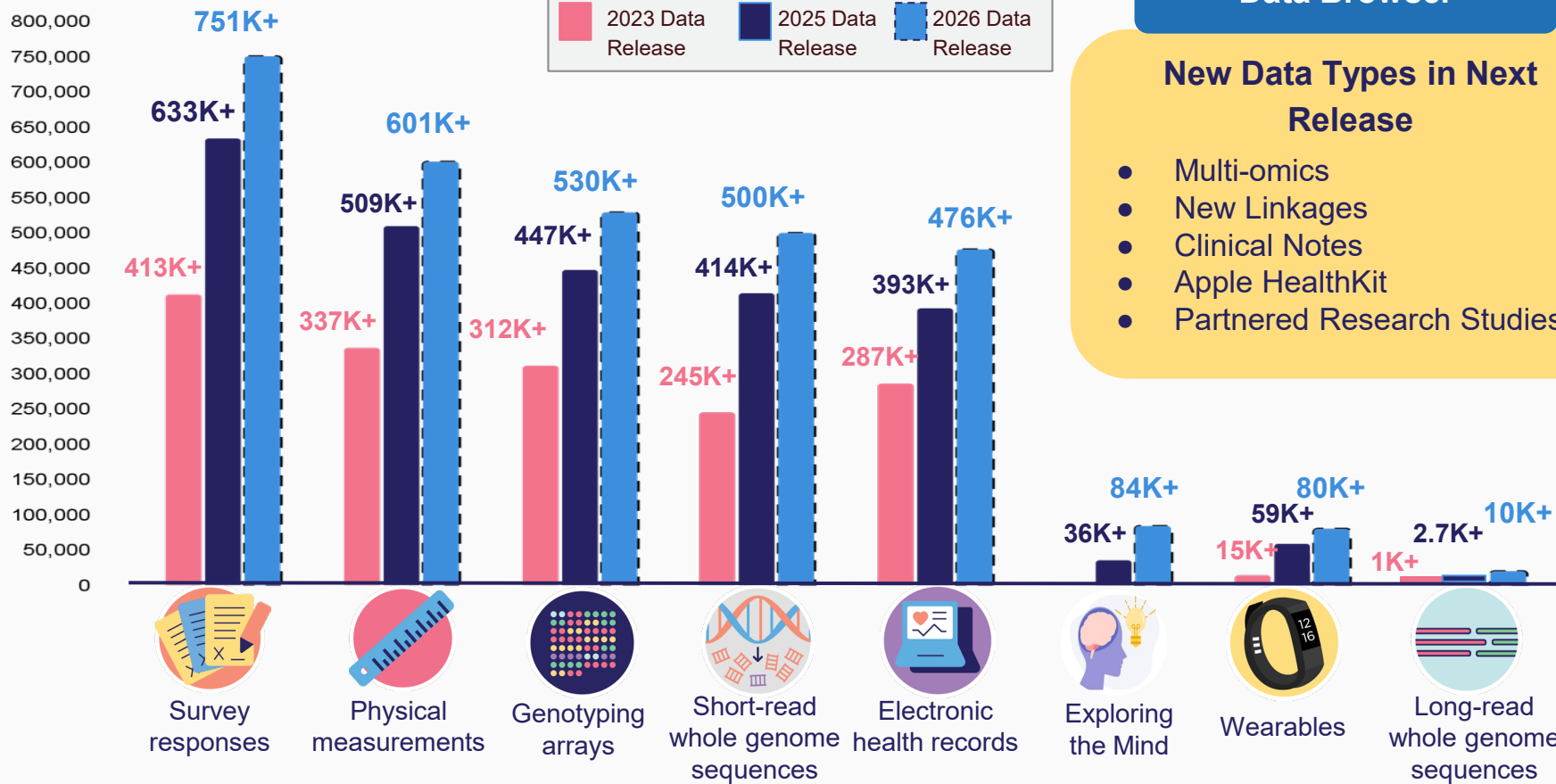
3,900+ (~3%) with variants in the ACMG 59 genes

108,000+ (100%) with PGx variants impacting at least one of 50+ medicines

Major New Data Releases Every 1 to 2 Years



Data Browser



New Data Types in Next Release

- Multi-omics
- New Linkages
- Clinical Notes
- Apple HealthKit
- Partnered Research Studies

Data Tiered Access Levels Enable Discovery



Available to
Anyone



Available to
Registered
Researchers

PUBLIC TIER

- **Data Snapshots:** Aggregated overviews of participant characteristics and data types
- **Data Browser:** Aggregated *All of Us* data including survey responses, physical measurements, data from electronic health records (EHRs) and wearables, and genomic data
- **Research Projects Directory:** Descriptions of each research project within the Researcher Workbench

RESEARCHER WORKBENCH

REGISTERED TIER

Registered researchers can access in-depth data and a variety of research tools to conduct a wide range of studies.



Surveys



EHRs



Physical
Measurements



Wearables

CONTROLLED TIER

Registered researchers with additional agreements can access the Registered Tier data plus additional and expanded data types.



Genomics



Health and
Lifestyle surveys

All data have been processed to protect participant privacy

All of Us Research Hub: Public Data Browser



Summary statistics of:

- EHR Data (Conditions, Drug Exposures, Lab & Measurements, Procedures)
- Genomic Variants
- Survey Questions
- Physical Measurements
- **Open Access (no login required)**

Data Browser



Search Across Data Types ¹

Data includes 633,540 participants as of 10/1/2023.

FAQ

Electronic Health Records (EHR)

Conditions

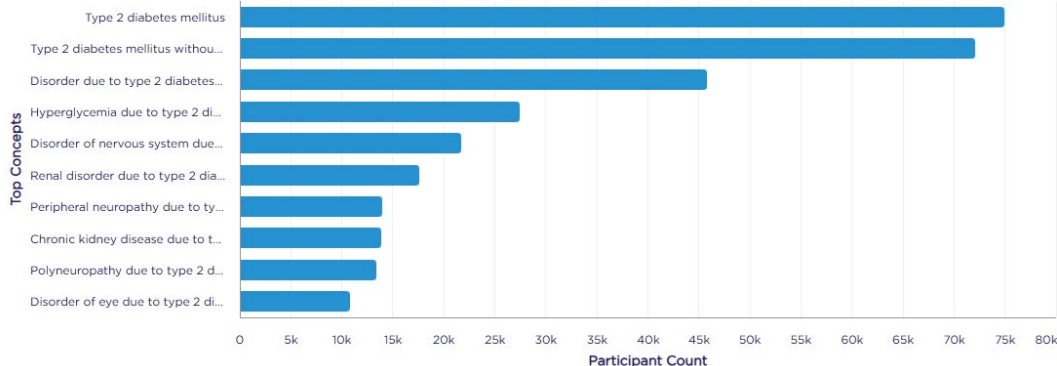
167

matching med

354,400 parti

View Condit

Top 10 Conditions by Descending Participant Counts ▾



All of Us Researcher Workbench: Access to Row-Level Data for Analysis

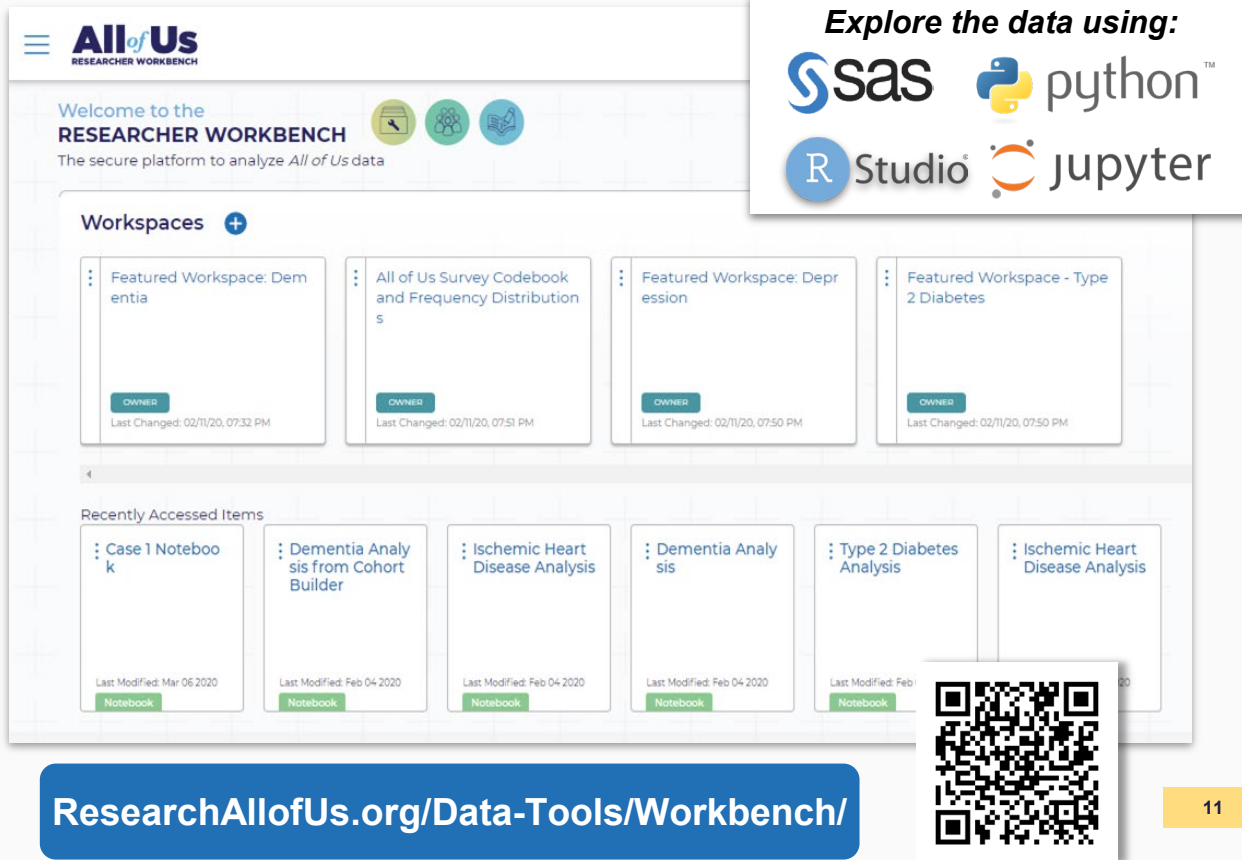


Researcher Workbench

- Cloud-based platform
- Graphical tools for creating cohorts and datasets
- Open to researchers at academic, not-for-profit, and health care institutions
- **Passport access model** with institutional agreements for all researchers
- **No separate IRB approval needed**

Explore the data using:



ResearchAllofUs.org/Data-Tools/Workbench/

What Does It Look Like To Do an Analysis in *All of Us*? A Genome Wide Association Study (GWAS) of Type 2 Diabetes

Workspace



Cohort
Builder



Concept Set
Selector



Dataset
Builder



Jupyter
Notebook

All of Us
RESEARCHER WORKBENCH

Welcome to the
RESEARCHER WORKBENCH
The secure platform to analyze *All of Us* data

Workspaces +

Create your first workspace
As you create your workspaces, this area will store your most recent workspaces.
To see all workspaces created, click on **See all workspaces** to the right.

Cohorts +

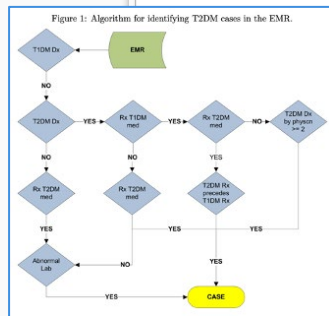
A cohort is a group of participants based on specific criteria.



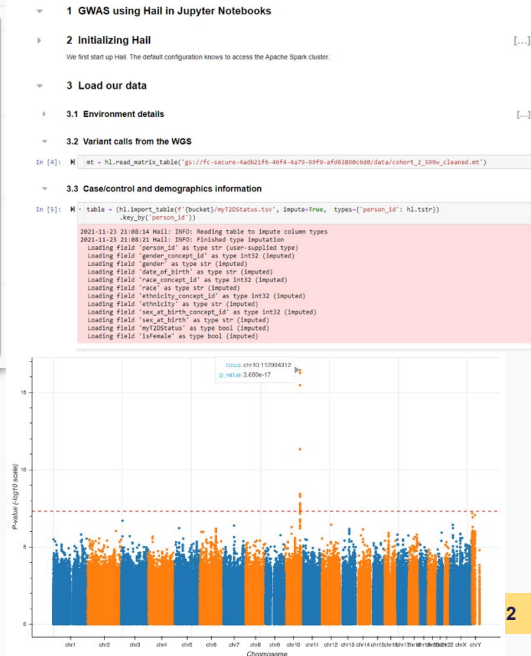
Participant ID 1
Participant ID 2
Participant ID 3
Your Cohort

Datasets +

A dataset is a table containing data about a cohort that can be exported for analysis.



- ~23M SNPs
- ~20k participants
- GWAS runtime of under 1 hour
- Cost under \$100



Scientific and Clinical Impact of *All of Us* On Precision Medicine

All of Us Data Leads to Impactful Health Discoveries

New discoveries in rare disease, chronic conditions, ophthalmology, neurology, preventive medicine and more!

nature communications

Explore content ▾ About the journal ▾ Publish with us ▾

Medical history predicts phenome-wide disease onset and enables the rapid response to emerging health threats

nature communications

Article <https://doi.org/10.1038/s41467-024-52562-5>

Impact of population screening for Lynch syndrome insights from the All of Us data

nature medicine

Article <https://doi.org/10.1038/s41591-022-02012-w>

Association of step counts over time with the risk of chronic disease in the All of Us Research Program

HGG
Advances

ARTICLE

Intersection of rare pathogenic variants from TCGA in the All of Us Research Program v6

Blaine A. Bates,^{1,2} Kylee E. Bates,³ Spencer A. Boris,¹ Colin Wessman,¹ David Stone,¹ Justin Bryan,¹ Mary E. Davis,^{3,4} and Matthew H. Bailey^{1,5,6,*}



Diabetes Care

ORIGINAL ARTICLE | JANUARY 22 2025

Additive Value of Polygenic Risk Score to Family History for Type 2 Diabetes Prediction: Results From the All of Us Research Database

Ophthalmology[®] AMERICAN ACADEMY OF OPHTHALMOLOGY[®]

FULL LENGTH ARTICLE • Articles in Press, January 20, 2025

Genome-Wide and Rare Variant Association Studies of Amblyopia in the All of Us Research Program

nature communications

Article <https://doi.org/10.1038/s41467-024-55636-6>

Integrating electronic health records and GWAS summary statistics to predict the progression of autoimmune diseases from preclinical stages

Gastro Hep
Advances ▶ aga

RESEARCH LETTER • Volume 4, Issue 1, 100535, 2025 • Open Access [Download Full Issue](#)

Association of Statin, Metformin, and Aspirin Use With Hepatocellular Carcinoma in the All of Us Research Program

Erik Almazon^{1,2} • Raymond T. Chung^{2,3,4,5}

Neurology[®]

The most widely read and highly cited peer-reviewed neurology journal

Polygenic Susceptibility to Diabetes and Poor Glycemic Control in Stroke Survivors

Zachariah S. Demaris, Carolyn Conlon, Cyprien A. Rivier, Santiago Clocchiatti-Tuozzo, Daniela Renedo, Victor Torres-Lopez, Kevin N. Sheth, ... SHOW ALL ... and Guido J. Falcone [AUTHORS INFO & AFFILIATIONS](#)

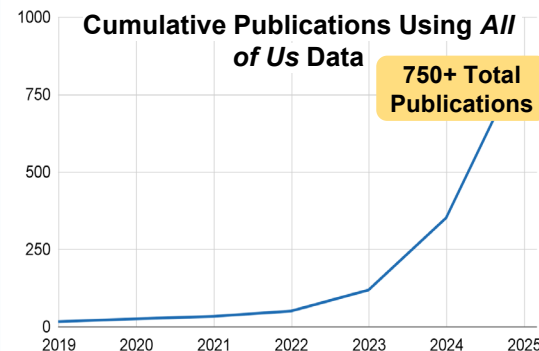
February 25, 2025 issue • 104 (4) • <https://doi.org/10.1212/WNL.000000000000210276>

Epidemiology and Psychiatric Sciences

cambridge.org/eps

Associations between social determinants of health and mental health disorders among U.S. population: a cross-sectional study

S. Tanarsuwongkul¹, J. Liu², M. Spaulding¹, K. Perea-Schmittle¹, M. Lohman²



Integration of Results from *All of Us* Data into Clinical Care

09/03/2025

Mass General Brigham Launches Genetic Test Developed in Collaboration with Broad Clinical Labs to Predict Risk Across Eight Cardiovascular Conditions

- Developed on genotypic and clinical data from 236,393 All of Us participants
- Integrated publicly available polygenic risk scores for each of eight conditions to develop a single, integrated score for each condition
- Validated in participants from the Mass General Brigham Biobank
- Clinician-ordered test is now available through Broad Clinical Labs/Mass General Brigham

Routine Integration of the Exposome and Genomics is Essential for Achieving Precision Medicine

Comment

<https://doi.org/10.1038/s41576-025-00883-6>

Integrating the genome and exposome for precision health in Kuwait

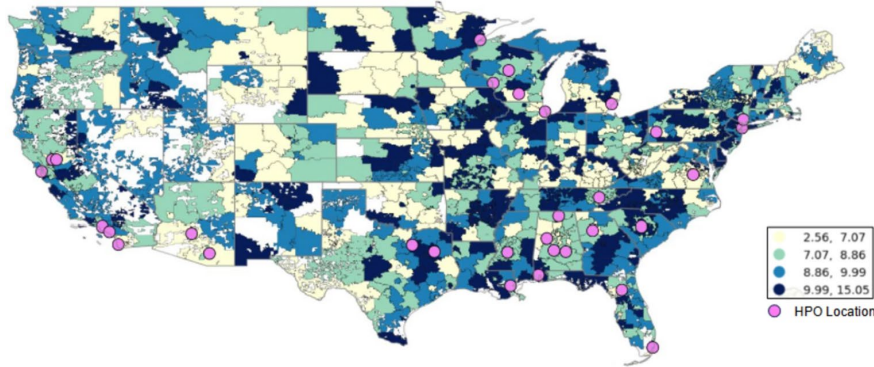
Hamad Ali, Barrak Alahmad, Faisal H. Al-Refaei, Ahmad Abou Tayoun, Hilal A. Lashuel, Salman Al Sabah & Fahd Al-Mulla

 Check for updates

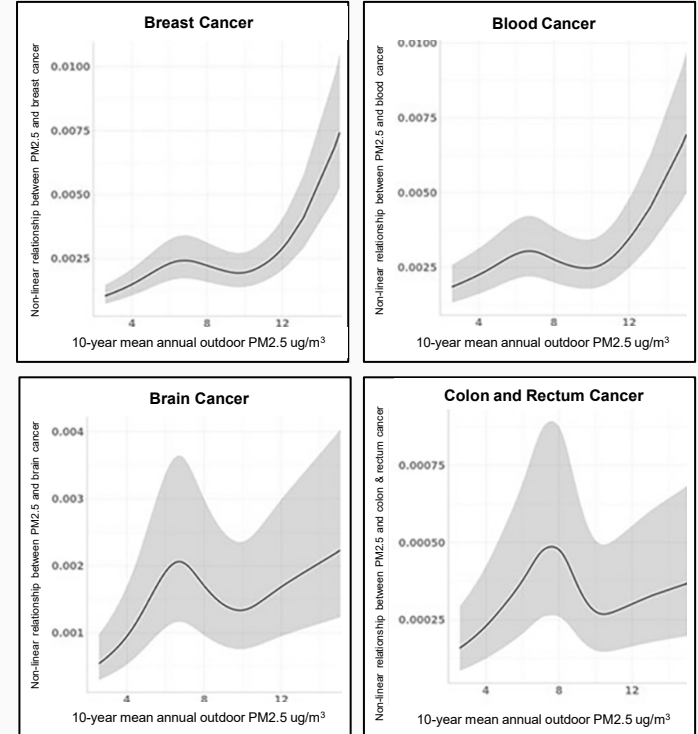
- Environmental conditions of Kuwait (extreme heat, air quality) make it an ideal system to test gene-environment interactions
- The simultaneous collection of exposure data along with genomics and wearables will enable deeper analyses at the outset of any new cohorts
- Strong data governance and privacy principles should be baked into cohort infrastructure

All of Us Discoveries: Air Quality and Cancer Risk

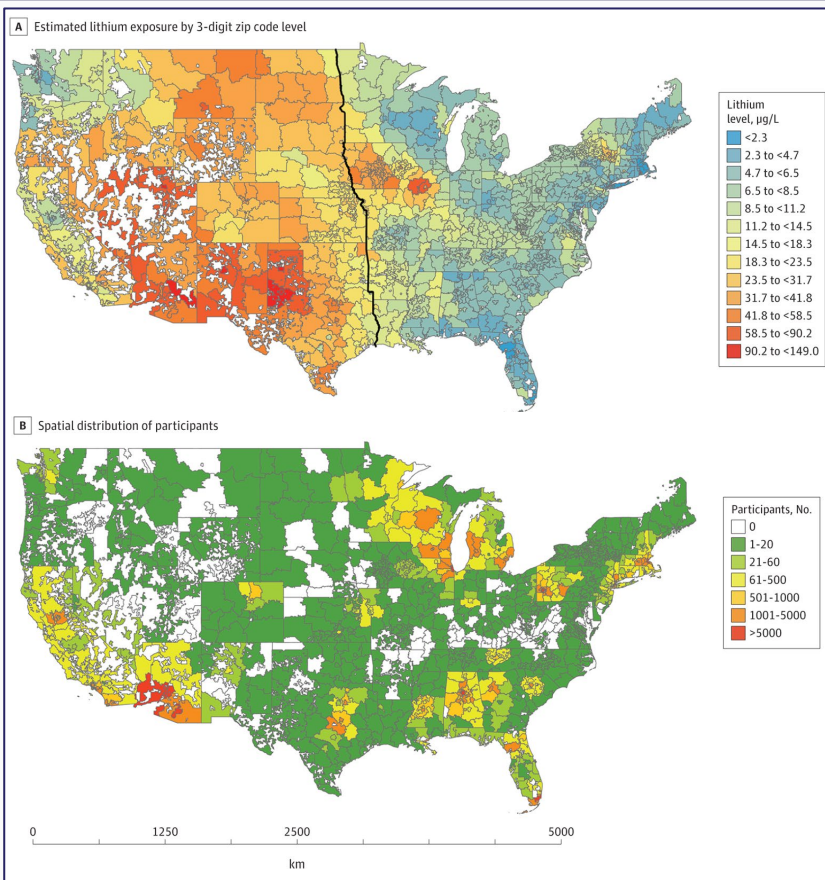
Ambient mean PM_{2.5} estimates in *All of Us* participant locations



PM_{2.5} exposure was associated with increased odds for several cancers, including breast, blood, brain, and colon and rectum cancers.



All of Us Discoveries: Lithium Groundwater and Cancer Risk



Original Investigation | Environmental Health

February 20, 2025

Cancer Risk and Estimated Lithium Exposure in Drinking Groundwater in the US

Jiajun Luo, PhD, MPH^{1,2}; Liang Zheng, MD, PhD³; Zhihao Jin, MPH⁴; et al.

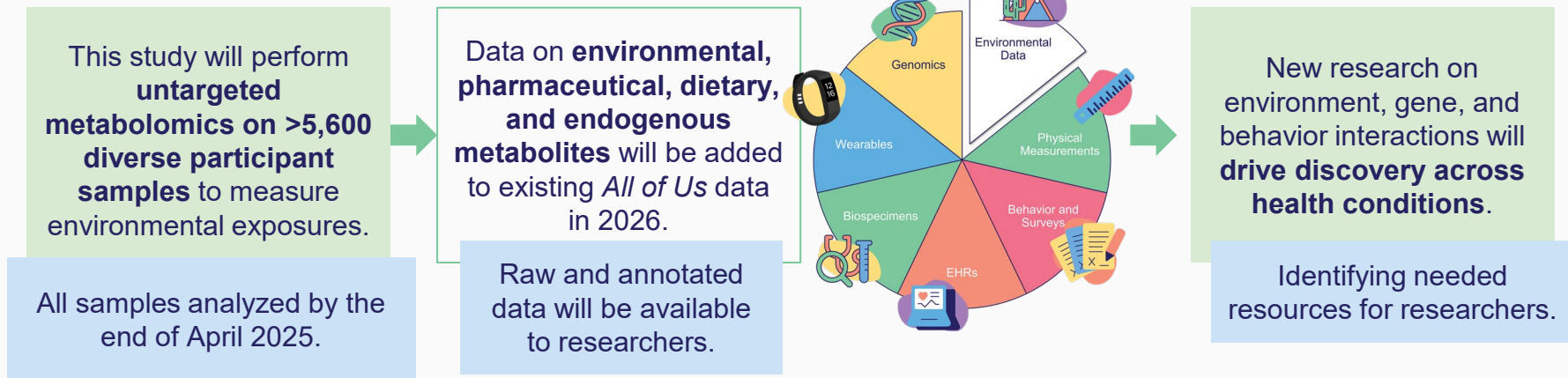
> Author Affiliations | Article Information

JAMA Netw Open. 2025;8(2):e2460854. doi:10.1001/jamanetworkopen.2024.60854

A study of more than 25,000 *All of Us* participants found that **higher lithium exposure** in drinking water was related to **lower incidence of cancer**.

New Insights into the Impact of Exposomics and Environmental Health

Goal: Assess **environmental exposures** and their interactions with genomic and behavioral health factors (study in collaboration with NIH NIEHS).



Initial investigation focuses on participants with Type 2 diabetes (incident since joining *All of Us*) but provides a model for future studies to follow adding more metabolomics data.

Polyexposure Score (PXS)

- Composite score combining exposures across the lifespan
- Captures broad cumulative effects of modifiable factors on health
- Highlights interactions among exposures rather than any single risk
- Prioritizes intervenable exposures; those that can be prevented or treat
- Examples: Occupational hazards, lifestyle risks, stressors

Adding New Data Types to *All of Us*: Partnered Research Studies

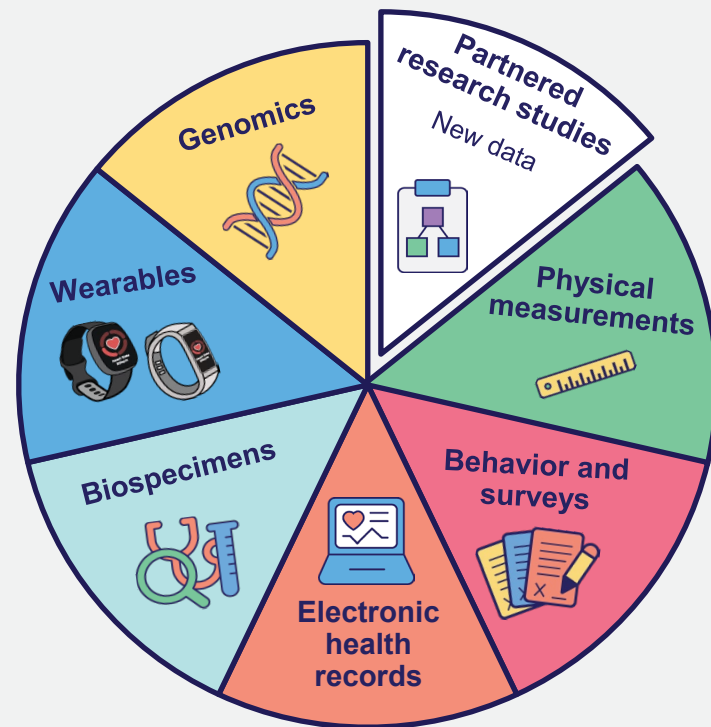
Partnered Research Studies are Important Drivers of Discovery

These partnered research initiatives allow researchers to leverage the program's resources to drive discovery by collecting and adding new data to the *All of Us* dataset.

- Partnered research studies align with the program's core values
- These studies support new data collection or generation and return additional value to participants
- New data will be made available through the Workbench
- Partnered research studies are externally funded

The program is building its capacity to support partnered research studies by partnering first with NIH Institutes, Centers, and Offices. In the future, researchers outside of NIH will be able to propose studies.

allof-us.org/PartneredResearchStudies



Incorporating partnered research study and core data will help researchers address complex questions about how genomic, environmental, and social interactions influence human health.

Current Partnered Research Studies: Enabled by *All of Us* for NIH Institutes & Centers

Platform Enables Fast Access to Research-Ready Participants



Nutrition for Precision Health

Powered by the *All of Us* Research Program, part of the National Institutes of Health

World's largest study of precision nutrition!

Exploring how personalized diets can improve health and prevent chronic diseases through the study of diet and physiological responses in at least 8,000 people.

National News Spotlights

CBS NEWS
SUNDAY
MORNING



Watch the Video



National
Eye
Institute

NATIONAL INSTITUTES OF HEALTH

Eyes On Health

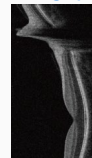
Eyes are the window to the body, and we will capture ocular images from 5,000 *All of Us* participants to enhance research on cardiovascular, neurological, and behavioral health.

Data Collected and Released

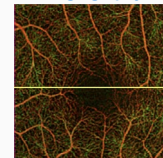
Color Fundus
Photo



Optical Coherence
Tomography



Optical Coherence Tomography
Angiography



National Institute of
Environmental Health Sciences



Studying influences of environmental exposures on Type 2 Diabetes

Investigating how genetics and environmental factors influence type 2 diabetes in 5,600 *All of Us* participants, one of the most costly and prevalent chronic health conditions in the country.



National Institute
of Mental Health



Understanding connections between health factors and behavior

Exploring the mind of 36,000 *All of Us* participants through four game-like cognitive tasks, supporting researchers in making connections between cognitive function, health factors and behavior.

Working Together

Working Together to Accelerate Research and Global Health Impact



Global Alliance
for Genomics & Health

There are >50M participants internationally in more than 100 cohorts participating in the **International Health Cohorts Consortium**



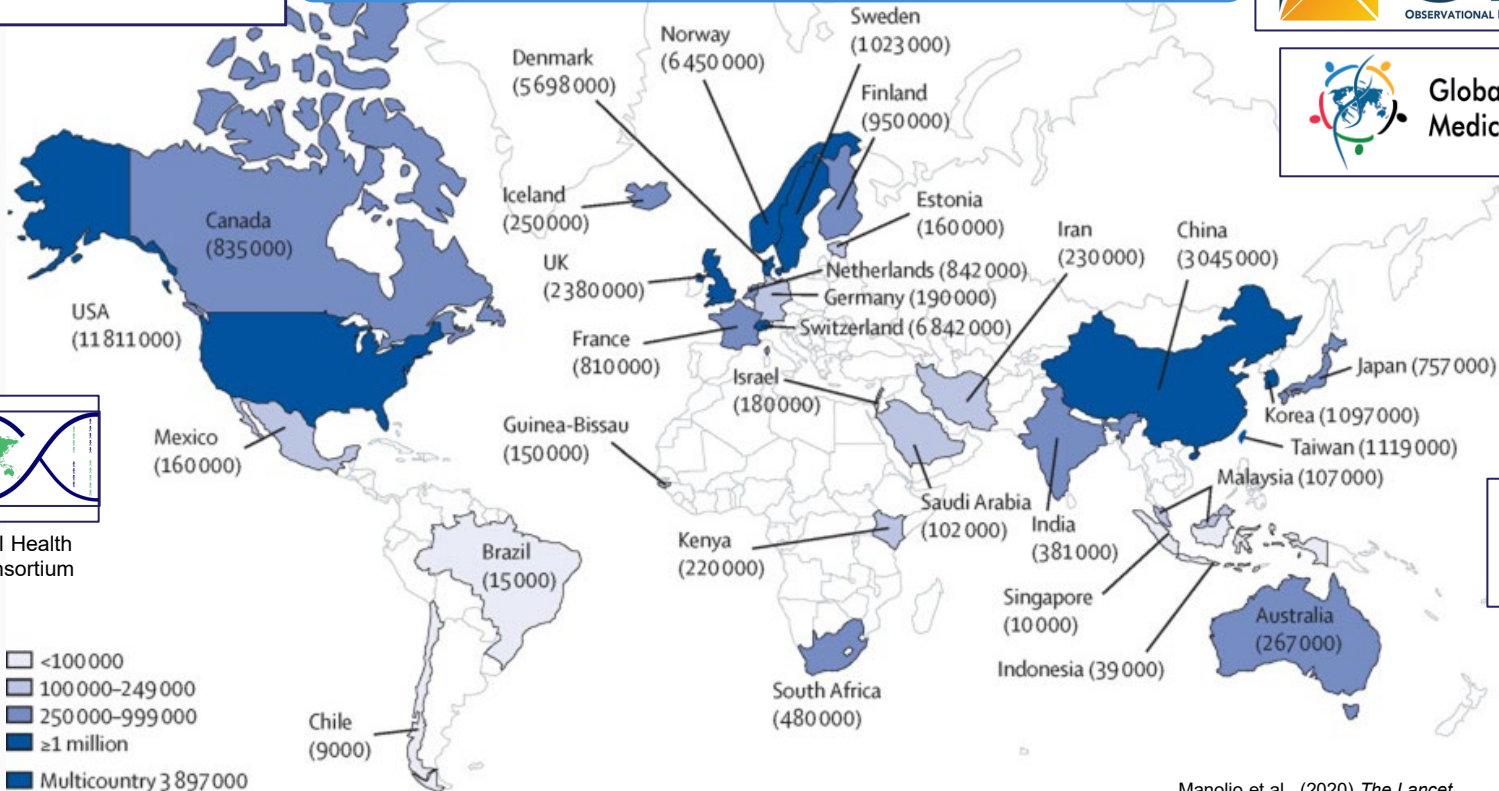
OHDSI
OBSERVATIONAL HEALTH DATA SCIENCES AND INFORMATICS



Global Genomic
Medicine Collaborative



DATA
BIOSPHERE



International Health
Cohorts Consortium

Opportunities for Global Exposome and Human Health Research

- Align to **shared standards** and **data models** (phenotypes, exposures, exposome)
- Set up a federated node or trusted research environment for **cross cohort analysis**
- Define **priority themes** – e.g, heat, air quality, occupational exposures
- Share **methods and tools**
- Build **talent and capacity**
- Convene the **community**

Opportunities for International Collaboration



Closing the Data Gap in Global Genomics, Medicine & Population Health (D2)

April 27-30, 2026 | Herrenhausen Palace, Hannover, Germany
Geoffrey S. Ginsburg, Michèle Ramsay, Lyndon Mitnaul and Naomi Allen

Scholarship Deadline: Jan. 6, 2026 | Short Talk Abstract Deadline: Jan. 6, 2026 | Poster Abstract Deadline: Apr. 6, 2026 | Early Registration Deadline: Feb. 26, 2026

Join the Researcher Workbench

Strengthen US-European scientific relationships:

- Data harmonization & common data models
- Standards development
- **Joint research projects**



230+ International
Data Access
Agreements Signed

Leverage All of Us Data to Advance Bold, Innovative Research: Discovery and Validation Opportunities

<https://bit.ly/43EjQa5>

Sample Language:

About the *All of Us* Research Program

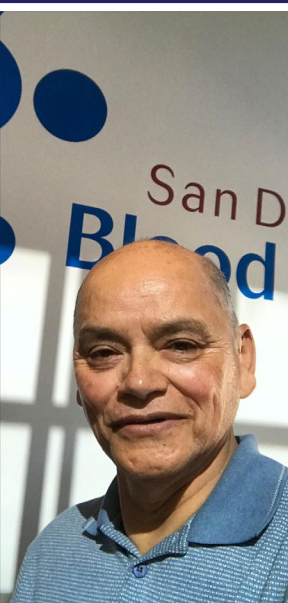
The *All of Us* Research Program is a historic effort to gather data and biospecimens from at least 1 million people living in the United States, with the goal of accelerating research and medical breakthroughs and enabling individualized prevention, treatment, and care.



AllofUs.NIH.gov

JoinAllofUs.org

ResearchAllofUs.org



Thank you to our 870,000+ participants!