



Health Disparities in Biomedical Research and the *All of Us* Research Program

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Site: LSU Health Sciences Center

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Health Disparities in Biomedical Research

Historical barriers to participation in research

- Women and minorities historically barred or discouraged from participation in medical research
- Some were laws and some was due to well-founded concerns regarding unethical research studies. Examples:
 - In 1977, the FDA banned women of childbearing age from participating in phase 1 and phase 2 clinical trials due to concerns about birth defects. Not lifted until 1993.
 - Tuskegee Study – studies like this one effect people's perception of research to this day

Modern-day Barriers to participation

Distrust of medical
research

Transportation
difficulties

Language barriers

Lack of knowledge
about programs

The *All of Us* Guide for diversity and inclusion.

Diversity Category	Represented in Biomedical Research	Underrepresented in Biomedical Research
Race and Ethnicity^a	Individuals who identify as White and non-Hispanic	Individuals who identify as other than White and non-Hispanic (i.e. Asian; Black, African or African American; Hispanic, Spanish, or Latino; Native Hawaiian or Pacific Islander; Middle Eastern or North African)
Access to Care	Individuals who have had a needed medical visit in the past 12 months or can obtain and pay for medical care as needed	Individuals who have not had a needed medical visit in the past 12 months or cannot easily obtain or pay for medical care as needed
Age^b	Adults ages 18–64	Children 17 or younger and adults 65 or older
Annual Household Income	Individuals with household incomes above 200% of the Federal Poverty Level	Individuals with household incomes equal to or below 200% of the Federal Poverty Level
Disability	Individuals without a physical or cognitive disability	Individuals with either a physical or cognitive disability
Educational Attainment	Individuals with a high school degree or equivalent	Individuals with less than a high school degree or equivalent
Gender Identity^a	Individuals who identify as either a man or a woman	Individuals who identify as gender variant, non-binary, transgender, or something else
Geography	Individuals who reside in urban metropolitan areas	Individuals who reside in rural and non-metropolitan areas
Sex Assigned at Birth^a	Male or female individuals	Individuals who are neither male nor female (i.e. intersex)
Sexual Orientation	Individuals who identify as straight	Individuals who identify as asexual, bisexual, gay or lesbian or something else

Table from Mapes BM, Foster CS, Kusnoor SV, Epelbaum MI, AuYoung M, Jenkins G, Lopez-Class M, Richardson-Heron D, Elmi A, Surkan K, Cronin RM, Wilkins CH, Pérez-Stable EJ, Dishman E, Denny JC, Rutter JL; All of Us Research Program. Diversity and inclusion for the All of Us research program: A scoping review. PLoS One. 2020 Jul 1;15(7):e0234962. doi: 10.1371/journal.pone.0234962. PMID: 32609747; PMCID: PMC7329113.

What were the results of not being represented in research?



Lack of diversity in biomedical research leads to researchers knowing less about certain populations. As a result, some therapies may not be as effective for individuals of underrepresented backgrounds.

Examples: Pharmacogenetics, gaps in knowledge about best practices of care in some populations

Example: Responses to Aspirin based on biological sex

- In 1977, the FDA banned women of childbearing age from participating in phase 1 and phase 2 clinical trials due to concerns about birth defects
- This ban was lifted in 1993
- Women were generally not included in clinical trials during this time period
- Women may respond to a drug in a different way than men due to differences in size, body composition, and hormone levels
- Example: Taking low doses of aspirin benefits men and women in different ways

Example: Pharmacogenetics

- Cytochrome P450 C19 (abbreviated CYP2C19)
- Liver enzyme involved in the metabolism of certain drugs
- Depending on the version of the gene you have, you may respond differently to certain medications:
 - Clopidogrel (Plavix)
 - Sertraline (Zoloft)

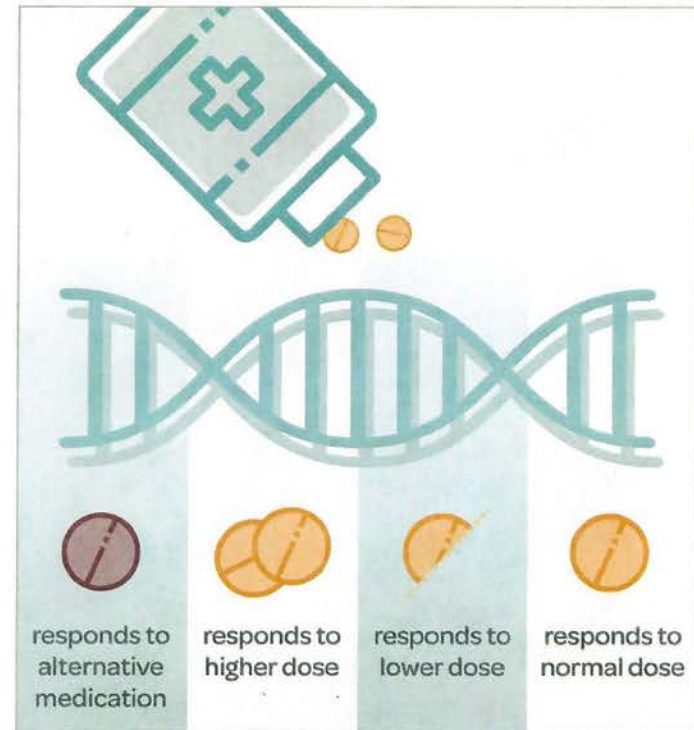


Image from <https://www.genelex.com/what-is-pharmacogenetics/>

Pharmacogenetics (cont.)

Genotyping for clopidogrel responsiveness

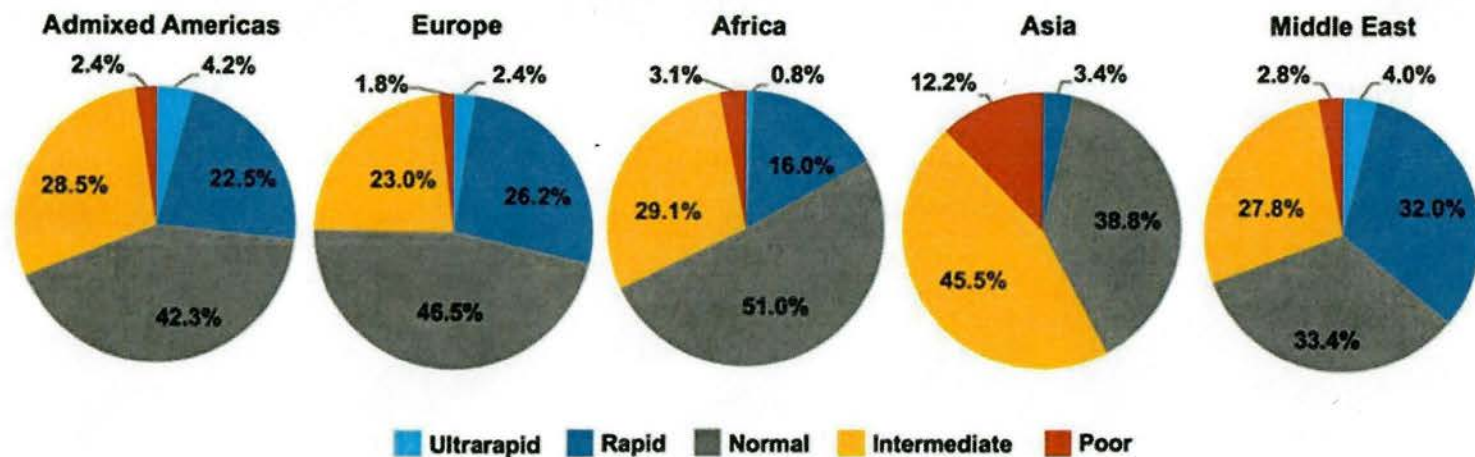
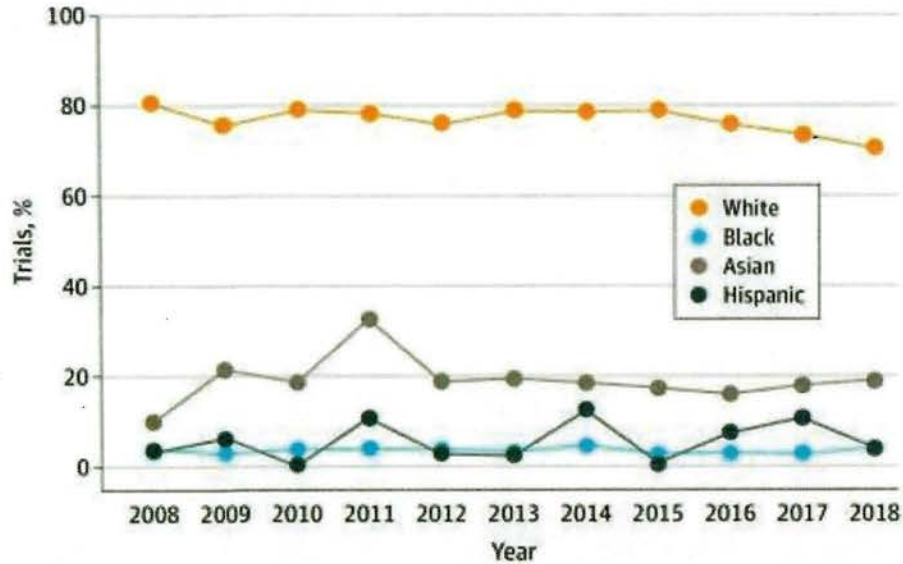


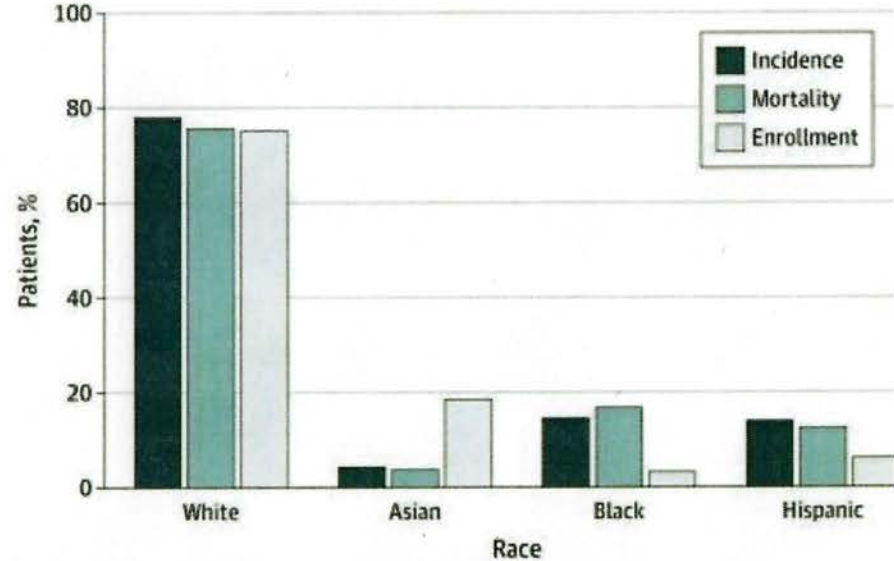
Image from: Klein MD, Williams AK, Lee CR, Stouffer GA. Clinical Utility of CYP2C19 Genotyping to Guide Antiplatelet Therapy in Patients With an Acute Coronary Syndrome or Undergoing Percutaneous Coronary Intervention. *Arterioscler Thromb Vasc Biol.* 2019 Apr;39(4):647-652. doi: 10.1161/ATVBAHA.118.311963. PMID: 30760018.

Racial Demographics of Clinical Trials Leading to Cancer Drug Approvals From 2008 to 2018

A Percentage of patients enrolled in FDA drug approval trials by race



B Comparison of incidence and mortality of patients with cancer vs trial enrollment



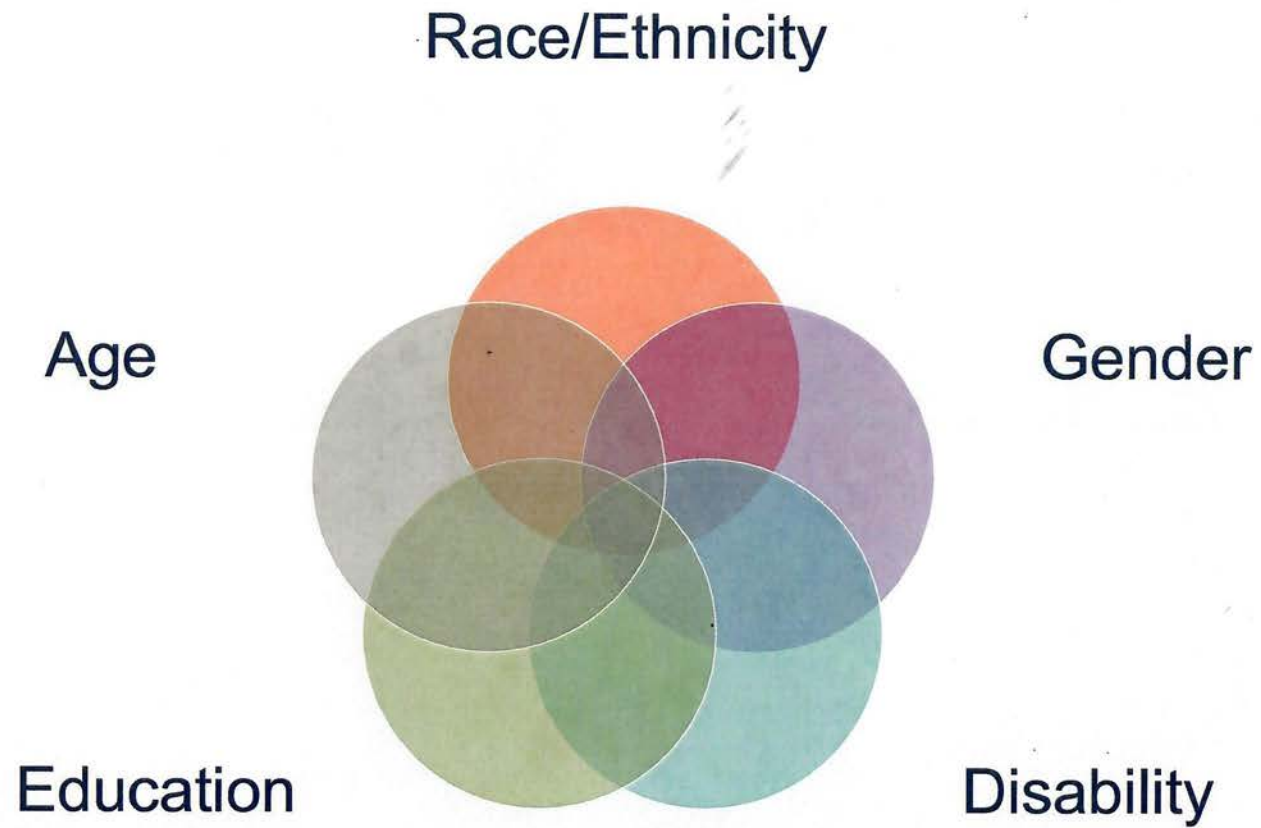
Source: Loree, Jonathan M et al. "Disparity of Race Reporting and Representation in Clinical Trials Leading to Cancer Drug Approvals From 2008 to 2018." *JAMA oncology*, vol. 5,10 e191870. 15 Aug. 2019, doi:10.1001/jamaoncol.2019.1870

Sexual and Gender Minorities (SGM)

- ◉ Includes members of the lesbian, gay, bisexual, and transgender community (LGBT)
- ◉ Unique healthcare needs and unequal access to health care.
Examples:
 - Facing effects of bullying and discrimination
 - Access to gender-affirming therapies
- ◉ Discrimination and mistrust of medical establishment is a barrier to participation in medical research

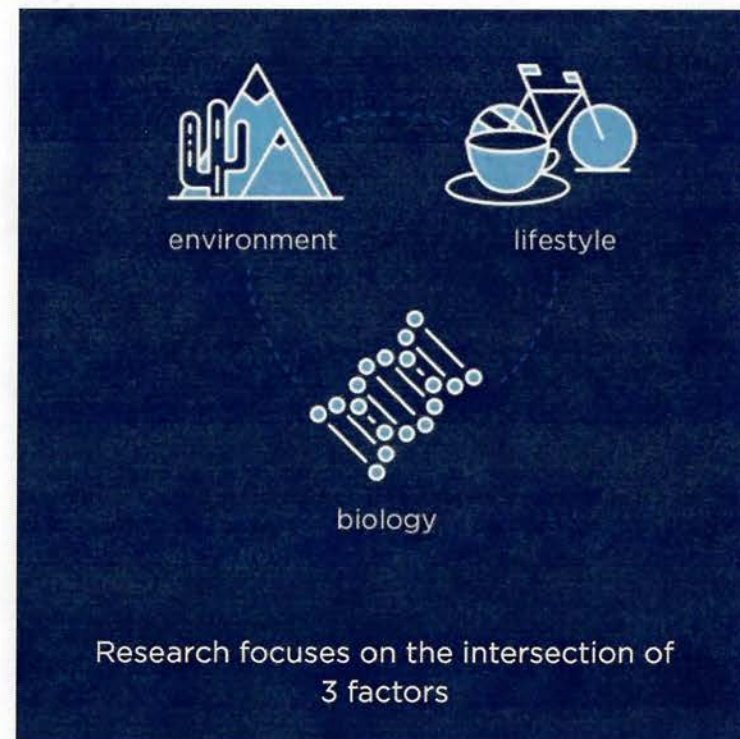


Intersectionality



Diversity and precision medicine

- **Precision medicine** is an emerging approach for disease treatment and prevention that takes into account individual variability in lifestyle, environment, and biological makeup.
- In order to develop treatments that work for everyone, we need a diverse group of participants



What policies have been passed to improve biomedical research?

- Guideline for the Study and Evaluation of Gender Differences in the Clinical Evaluation of Drugs
 - Reversed recommendation that women of childbearing age be excluded from early clinical studies
- Sec. 907 of the Food and Drug Administration Safety and Innovation Act (FDASIA),
 - Passed in 2012
 - Directed FDA to investigate how well demographic subgroups (sex, age, race and ethnicity) in applications for medical products – drugs, biologics and devices, submitted to the agency for marketing approval

What is being done to change how biomedical research is conducted?

- The *All of Us* Research Program, which was launched by the National Institutes of Health in 2015, was created to address some of the challenges encountered in research.
- The goal of *All of Us* is to speed up health research discoveries, enabling new kinds of individualized health care. To make this possible, the program is building one of the world's largest and most diverse databases for health research.



The *All of Us* Research Program

All of Us
RESEARCH PROGRAM



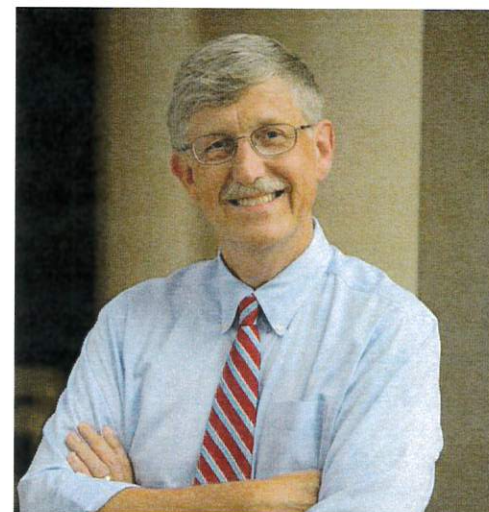
National Institutes
of Health

#joinallofus

What is the NIH *All of Us* Research Program?



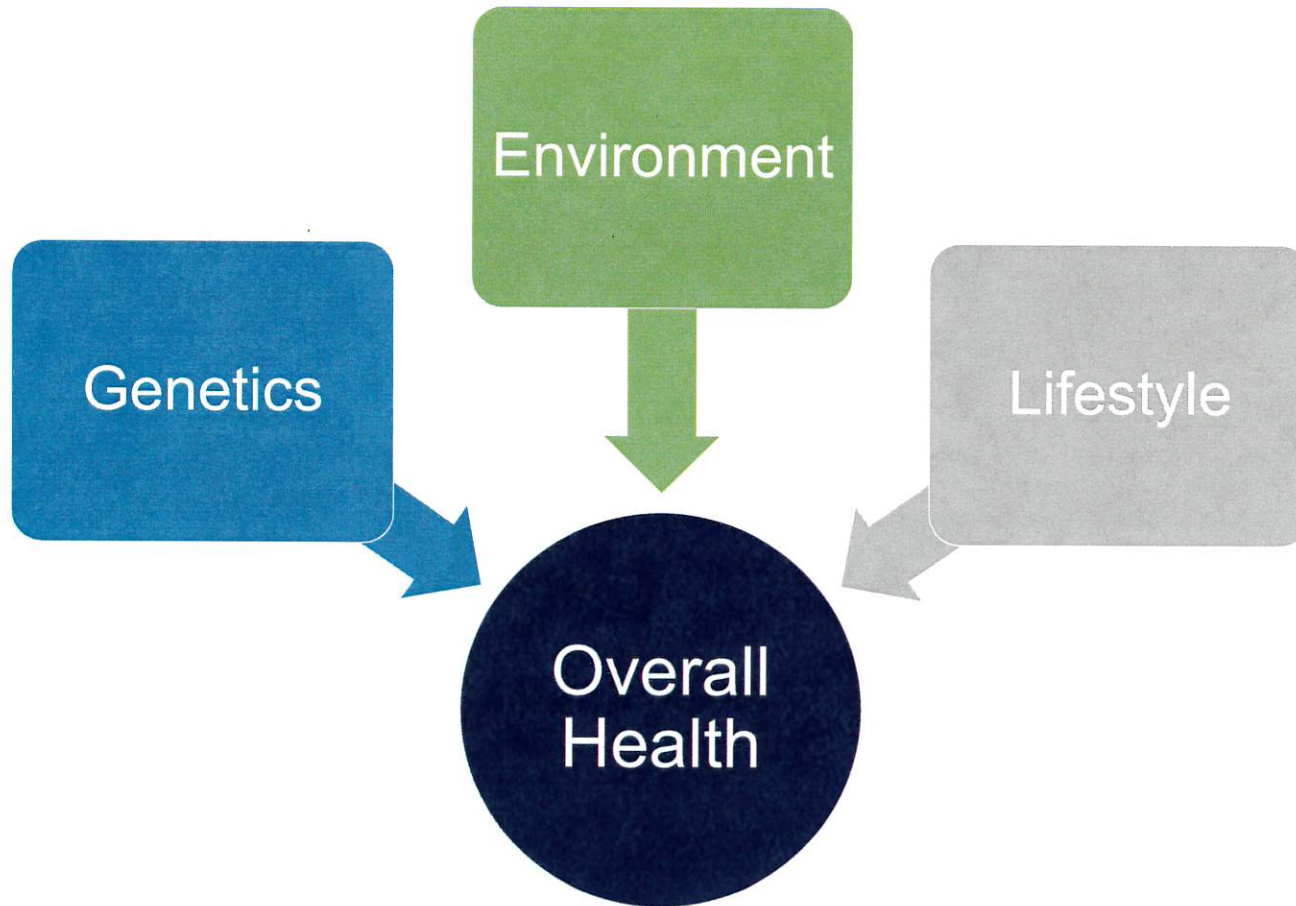
The *All of Us* Research Program is a historic, longitudinal effort to **gather data from one million or more people** living in the United States to **accelerate research and improve health**. By taking into account individual differences in **lifestyle, socioeconomics, environment, and biology**, researchers will uncover paths toward delivering **precision medicine – or individualized prevention, treatment, and care – for all of us**.



“All of Us is among the most ambitious research efforts that our nation has undertaken!”

NIH Director Francis Collins, M.D., Ph.D.

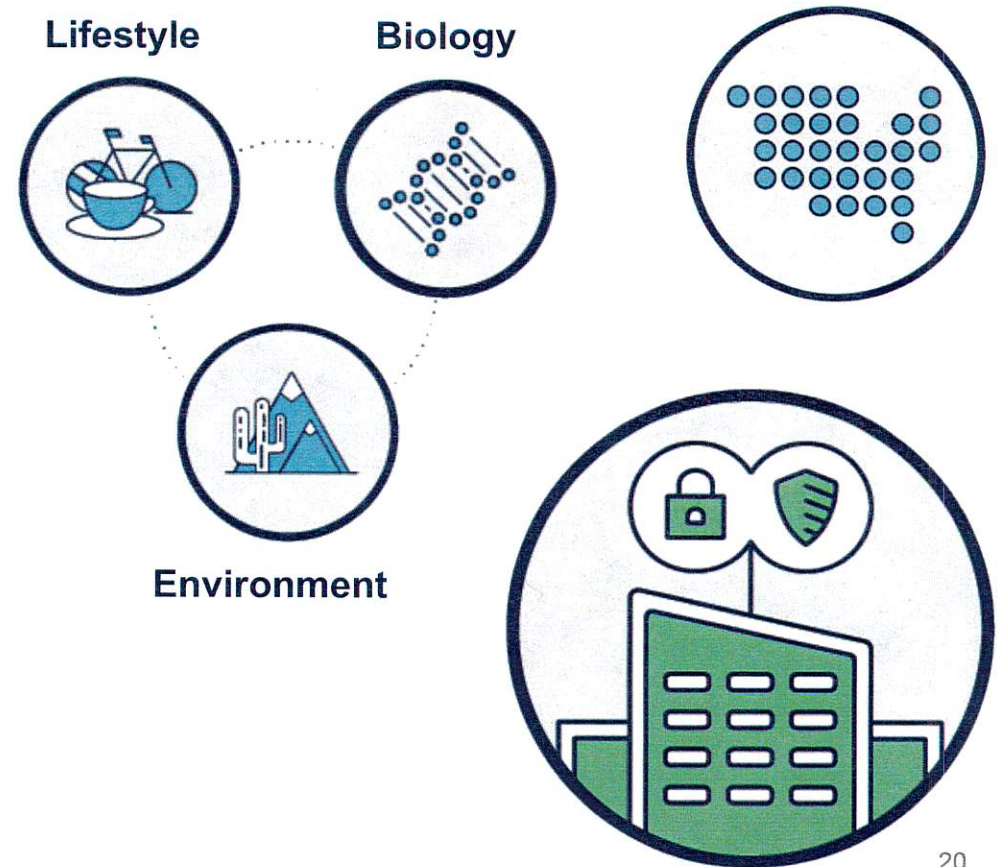
The *All of Us* Research Program is part of the broader Precision Medicine Initiative.



What is precision medicine?

Precision medicine is an emerging approach for disease treatment and prevention that takes into account individual variability in lifestyle, socioeconomics, environment, and biology.

It is a radical shift in how each of us can receive the best care possible based on our unique makeup.



What's a longitudinal study and why do we need it?

- The All of Us Research Program is expected to last for ten or more years
- Throughout the course of the program, surveys are released asking participants about their health
- Regarding a person's health, a lot of things can change over time
- Example: COPE Survey
 - Measured how participants mental and physical health was affected over the course of the COVID-19 pandemic

What are the potential activities asked of participants in the current protocol?



Enroll, Consent and Authorize EHR

- Recruiting 18+ years old initially; plan to include children later
- Online, interactive consent
- Includes authorization to share Electronic Health Record (EHR) data



Answering Surveys

- Six initial surveys: The Basics, Overall Health, Lifestyle, Health Care Access & Utilization, Family Medical History, Personal Health History
- **Additional surveys will be released on an ongoing basis.**



Physical Measurements*

- Blood pressure
- Heart rate
- Height
- Weight
- Hip circumference
- Waist circumference
- BMI

**Based on diverse sampling and capacity*



Provide Biosamples*

- Blood (or saliva, if blood draw is unsuccessful)
- Urine specimen
- Biosamples will be stored at the program's biobank

**Based on diverse sampling and capacity*



Wearables and Digital Apps

- Share data from wearable fitness devices, starting with Fitbit
- More integrations under development

Pilots under development: richer EHR data, health apps, fitness wearables, and return of genetic info

What is the promise for researchers?

- ◉ The opportunity to **save time and resources** and **accelerate your research breakthroughs** by leveraging:
 - A **rich resource of data**, including biospecimens and increasingly robust electronic health records.
 - A **longitudinal dataset** that will follow participants as they move, age, develop relationships, get sick, and try treatments.
 - A **diverse cohort of participants**, including people both healthy and sick, from all walks of life and all parts of the country.
 - Data that is already **cleaned and curated**.
 - **Robust computing and analytic tools** to support complex data analyses in a **secure data environment**.
 - A group of **engaged participants** who may be eager to participate in ancillary studies.
- ◉ The ability to easily **share workspaces and analyses** with research partners and reviewers.
- ◉ The chance to learn from the program's pilots and experiments and **leverage innovations** for other studies and cohorts.

Beta testing of our initial dataset and researcher tools began in May 2020.

What is the promise for providers?

- Over time, **increased scientific evidence and improved guidelines** to enable precision medicine opportunities for more people and conditions:
 - Better understanding of the **impact of environment and lifestyle factors** on health.
 - Increased knowledge of differences in risk factors and response to treatments among **diverse populations**.
 - More information on the development of conditions that will allow for **earlier detection**.
 - Deeper understanding of different conditions that may allow for **better stratification**.
- Innovations that may make it easier to **share electronic health records** with other providers and patients.
- New knowledge to help address **health disparities**, increase **patient engagement**, and understand the usefulness of **consumer health devices and apps**.



Help accelerate medical breakthroughs by sharing information about *All of Us* with your patients!

Why do we even need an *All of Us* Research Program?



People/ Patients

- Patients may not be served well by treatments designed for the “average” patient.
- Many people & populations have been left out of biomedical research, and thus, often left out of health care solutions.
- Health problems can take years to unravel and require much trial and error treatment.
- Patients may not have access to or make use of their own health data.



Professional Providers

- Precision medicine is still in the early days, so providers do not have enough information available to provide precision care for many conditions.
- Developing individualized approaches to care often requires overtime.
- It can be difficult to coordinate care between many different providers, especially with medical records and key data scattered in different silos.



Biomedical Researchers

- Researchers spend a lot of time and resources creating new IT systems, databases, and analytic tools.
- They also face enormous costs & time just to recruit participants.
- Data collection is often not standardized, and data can be siloed and difficult to integrate.
- A single lab’s resources may not be sufficient to answer the research questions that matter.

How will *All of Us* lead to discoveries?

Participants Share Data

Participants share health data online. This data includes health surveys and electronic health records. Participants also may be asked to share physical measurements and blood and urine samples.



Researchers Study Data

In the future, approved researchers will use this data to conduct studies. By finding patterns in the data, they may make the next big medical breakthroughs.

Researchers Share Discoveries

Research may help in many ways. It may help find the best ways for people to stay healthy. It may also help create better tests and find the treatments that will work best for different people.

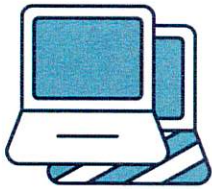
Data Is Protected

Personal information, like your name, address, and other things that easily identify participants will be removed from all data. Samples—also without any names on them—are stored in a secure biobank.

Participants Get Information

Participants will get information back about the data they provide, which may help them learn more about their health.

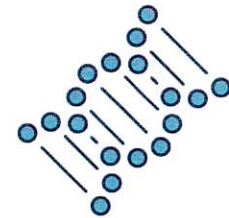
Why now?



We have technologies that can collect and crunch huge amounts of data.



More people are engaged in their health, and can track and share their data — like steps and sleep.



We have a greater understanding of human genes.

The time is right.

Approach to Privacy and Security

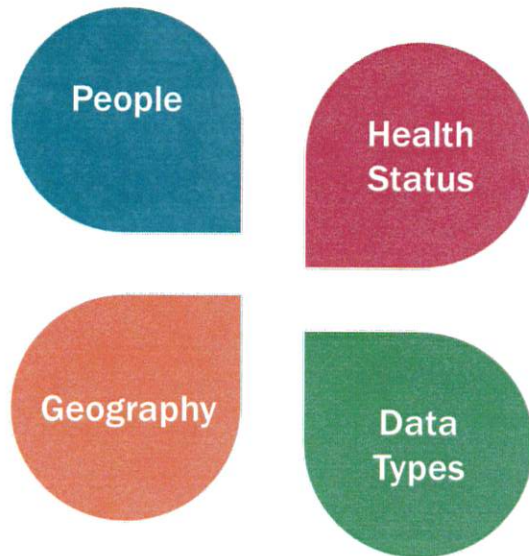
- Guided by privacy, trust, and data security principles developed by experts with input from the public.
- Data warehouse is built with the most advanced security available.
- Experts have done and will continue to do rigorous security testing.
- Data is encrypted and direct identifiers are removed.
- Researchers must agree to a code of conduct before accessing the data.
- Participants' preferences will be respected.
- Protected by a Certificate of Confidentiality.
- Committed to transparency in the event of a data breach.



Safeguarding your identity and data to the best of anyone's abilities is our most important responsibility.

Portfolio of Actions & Investments to Achieve Diversity

Vision: Reflect the country's rich diversity to produce meaningful health outcomes for communities historically underrepresented in biomedical research.



Incentivize HPO Network to Focus on UBR Communities

Build Up FQHC Research Capacity as Valuable HPO Partners

Invent Network of Direct Volunteer Partners

Grow a Network of National and Local Community Partners

Develop Specific Plans for Special Population Engagement

Build a User/Participant-Centered Design Culture and Process

Selected Scientific Opportunities

- Develop quantitative **estimates of risk** for a range of diseases by integrating environmental exposures and genetic factors
- Identify the causes of individual variation in response to commonly used therapeutics = **pharmacogenomics**
- Discover **biological markers** that signal increased or decreased risk of developing common diseases
- Develop **solutions to health disparities**
- Use **mobile health technologies** to correlate activity, physiological measures, and environmental exposures with health outcomes
- **Empower study participants** with data and information to improve their own health
- Create a platform to enable **trials of targeted therapies**



All of Us and COVID-19

COVID-19 Participant Experience (COPE) Survey:

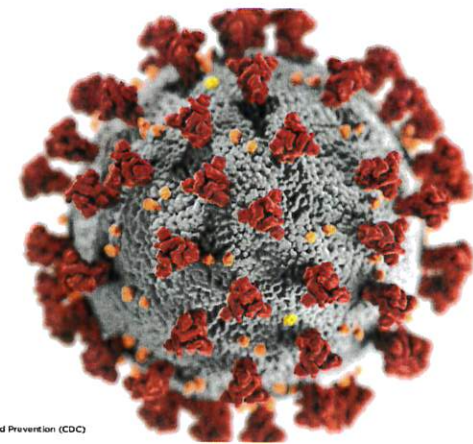
- This survey helps researchers learn how the pandemic is affecting people's physical and mental health

Antibody Testing:

- Blood samples from people who recently joined the program are being used to learn more about the origins and spread of COVID-19 in the United States

COVID-19 Electronic Health Record (EHR) Data:

- Researchers are studying participants health records to find out why COVID-19 affects people differently



Source: Centers for Disease Control and Prevention (CDC)

What can researchers learn from DNA?



Identify what makes people more or less likely to develop a disease



Find out how environment, lifestyle, and genes can impact health



Identify which treatments work best for different types of people



Create medications to treat or prevent common conditions, such as chronic pain or diabetes



Build better tools for detecting health conditions and encouraging healthy habits.

What information will we share with you?

We expect to share information about:



Your ancestry
(where your family comes from)



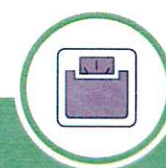
Your traits, such as
why you might love
or hate cilantro



Whether you may
have an increased
risk of developing a
particular health
condition



How your body
might react to
certain medications



Other
health-related
information

We plan to use many different methods to check your DNA for information.
You may get some DNA results sooner than others.

It will take some time to get your DNA results. Some participants
may not get their DNA information for a few years.

How will we protect your DNA information?

Your privacy and data security are very important to us. We will protect your DNA information in the same way we protect the other information you share with *All of Us*.

- **Your DNA information is de-identified**, which means that researchers studying your DNA will not know your personal details like your name or where you live.
- **We follow all federal, state, and local laws and regulations for keeping information safe.**
- We also have **Certificates of Confidentiality** from the U.S. government. They will help us fight legal demands to give out information that could identify you.
- We have **strict internal policies and procedures** to make sure your data is not misused. Researchers who want to study your DNA must promise not to try to identify you.
- We store information on **protected computers**. We limit and keep track of who can see it.
- We have security experts who have done and will keep doing thorough **security testing**.
- **We will tell you if there is a breach that is a risk to your privacy.**

Where can I learn more?

There are many great resources online for learning about DNA and genes. Some great places to start are:



The MedlinePlus *All of Us* site:
medlineplus.gov/allofus.html

National Institutes of Health's (NIH) Genetics Home Reference:
ghr.nlm.nih.gov

National Human Genome Research Institute's Introduction to Genomics: www.genome.gov/About-Genomics/Introduction-to-Genomics

National Institute of General Medical Studies Studying Genes Fact Sheet:
www.nigms.nih.gov/education/Pages/factsheet_studyinggenes.aspx

Wellcome Genome Campus' Your Genome:
yourgenome.org

University of Utah's Learn Genetics Basics:
learn.genetics.utah.edu/content/basics/

University of Utah's Teach Genetics Basics:
teach.genetics.utah.edu/content/dna

Can I see data from the *All of Us* Research Program?

Welcome to the *All of Us* Research Hub

The *All of Us* Research Program, part of the National Institutes of Health, is building one of the largest biomedical data resources of its kind. The *All of Us* Research Hub stores health data from a diverse group of participants from across the United States.

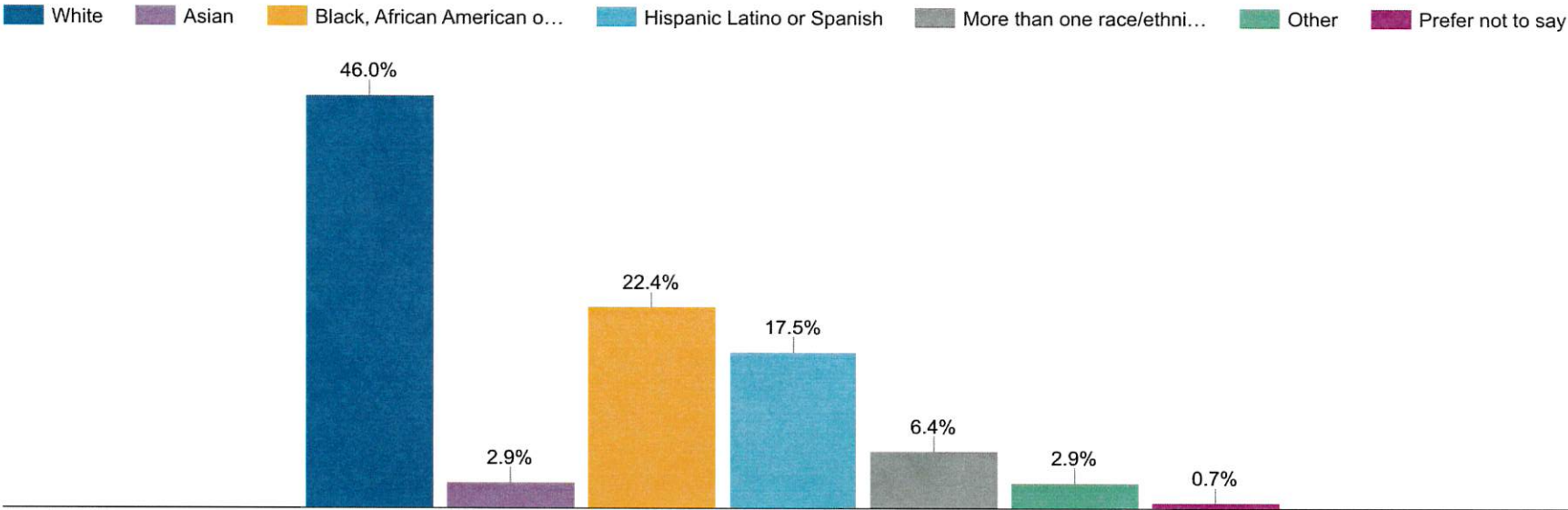
Approved researchers can access *All of Us* data and tools to conduct studies to help improve our understanding of health.

[APPLY FOR ACCESS](#)


Scroll Down

<https://www.researchallofus.org/>

Current *All of Us* Participant Demographics



Major building blocks of the *All of Us* Research Program consortium

DATA AND RESEARCH CENTER

Big data capture, cleaning, curation, & sharing in secure environment

Vanderbilt, Verily, Broad Institute

BIOBANK

Repository for processing, storing, and sharing biosamples (35+M vials)

Mayo Clinic

PARTICIPANT TECHNOLOGY SYSTEMS CENTER

Web and phone-based platforms for participants

Vibrent Health

GENOMICS PARTNERS

Genotyping and whole genome sequencing of biosamples; counseling and educational resources for participants

Baylor College of Medicine, Broad Institute, University of Washington, Color, HudsonAlpha, and partners

PARTICIPANT CENTER / DV NETWORK

Direct volunteer participant enrollment, digital engagement innovation, and consumer health technologies

Scripps Research Institute (with multiple partners)

HEALTH CARE PROVIDER ORGS NETWORK

HPOs with clinical & scientific expertise, enrollment & retention of participants

30+ regional medical centers, FQHCs, and VA

COMMUNICATIONS & COMMUNITY NETWORK

Communications, marketing, and design expertise; engagement coordination and community partners network

Wondros, HCM, University of Utah, and many community engagement partner organizations

All of Us Community and Provider Partner Network (as of January 2020)



All of Us Consortium Members *(beyond community partners, as of March 2020)*

The Participant Center



Communications & Engagement



HPO Network (Health Care Provider Organizations)

RMCS



Illinois Precision Medicine Consortium



All of Us New England



Trans America Consortium



New York City Consortium



All of Us Southern Network



All of Us SouthEast Enrollment Center



All of Us Wisconsin



All of Us Pennsylvania



University of Arizona and Banner Health



FQHCs (Federally Qualified Health Centers)



VA Medical Centers



Participant Technology Systems Center (PTSC)



Biobank



Data & Research Center (DRC)

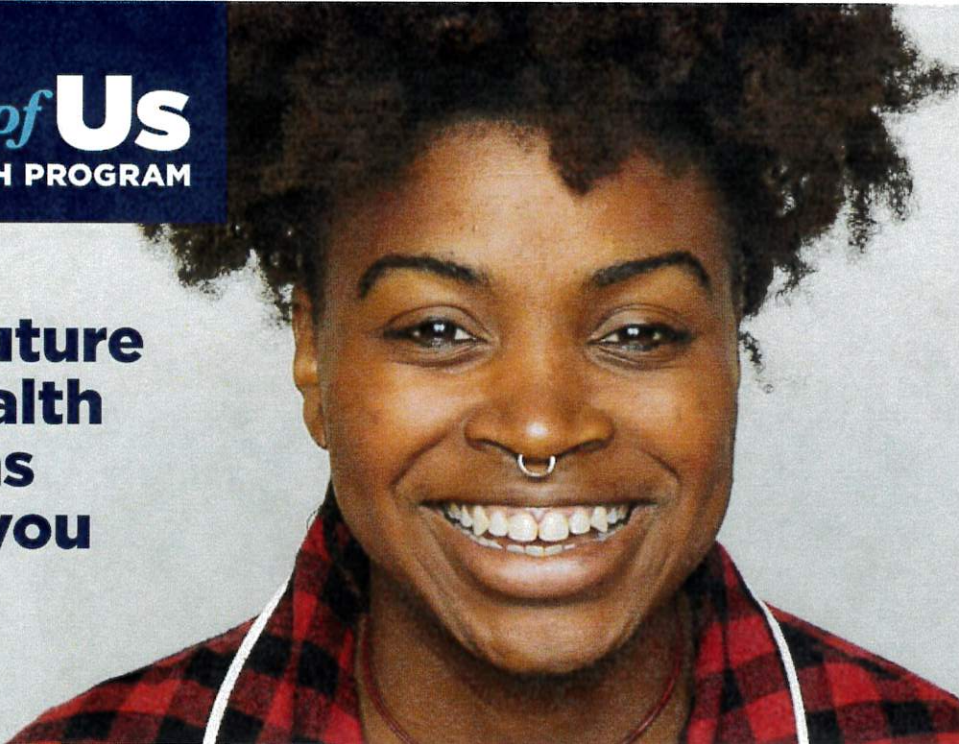


Genomics Partners



All of Us
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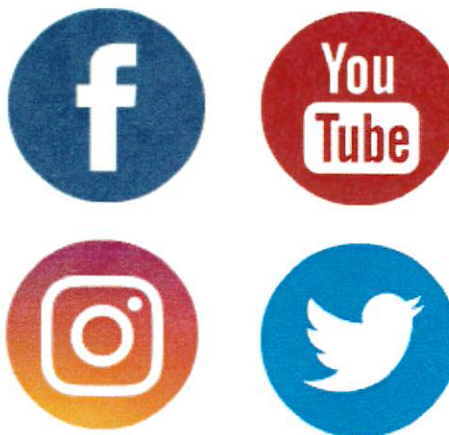
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of health
begins
with you**



National Institutes
of Health



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ResearchAllofUs.org



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Thank you!

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