Building a 1 Million Cohort

Mine Cicek, Ph.D.
Mayo Clinic
A federal effort “Precision Medicine Initiative (PMI)” launched in 2015 by former president Obama.

To accelerate health research and medical breakthroughs, enabling individualized prevention, treatment, and care for all of us.
Participation in the *All of Us* Research Program will be **open** to all interested individuals

The program will reflect the rich **diversity** of America

Participants will be **partners** in the program

Trust will be earned through robust **engagement** and full **transparency**

Participants will have **access** to information and data about themselves

Data from the program will be broadly **accessible** to empower **research**

The program will adhere to the PMI **Privacy** and **Trust** Principles and the PMI **Data Security** Policy Principles and Framework

The program will be a catalyst for **innovative research** programs and policies
Program Infrastructure

DATA AND RESEARCH CENTER (DRC)
Big data capture, cleaning, curation, & sharing in secure environment

Vanderbilt, Verily, Broad Institute

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

Mayo Clinic

PARTICIPANT CENTER
Direct volunteer participant enrollment, digital engagement innovation, & consumer health technologies

Scripps Research Institute (with multiple partners)

PARTICIPANT TECHNOLOGY SYSTEMS CENTER
Website & mobile apps for participants

Vibrent Health

HEALTH CARE PROVIDER ORGS (HPOs)
Clinical & scientific expertise network, enrollment & retention of participants

20+ regional med centers, FQHCs, VA, future awards to grow network

COMMUNICATIONS & ENGAGEMENT
Comms, marketing, & design expertise; engagement coordination & community partners network

Wondros, HCM, and growing network of community partners
HPOs: Regional Medical Centers (RMCs)

- Able to enroll diverse patient populations
- Strong electronic health record capacity
- Geographic spread
- Capacity to enroll many participants each year

- California Precision Medicine Consortium
- Illinois Precision Medicine Consortium
- University of Arizona (w/ Banner Health)
- SouthEast Enrollment Center
- All of Us, Wisconsin
- University of Pittsburgh
- New York City Precision Medicine Consortium
- New England Precision Medicine Consortium
- Trans-American Precision Medicine Consortium for the Health Care Systems Research Network
- Southern All of Us Network

All of Us, Wisconsin

Center for INDIVIDUALIZED MEDICINE
Federally Qualified Health Center (FQHC)

- Develop and pilot health center approaches for enrolling special populations, especially those historically underrepresented in biomedical research

- A collaboration with the Health Resources and Services Administration (HRSA) and the MITRE Corporation
HPOs: VA Medical Centers

- Invite veterans to enroll in the *All of Us* Research Program at participating VA medical centers

- A collaboration with the Department of Veterans Affairs and the Million Veteran Program, a national, voluntary research program studying how genes affect health

- 20 participating sites anticipated
Two Methods of Engagement
Inclusion Criteria

- **Capacity**: Capable of understanding and providing informed consent
- **U.S. Residence**: Lives in the U.S. or U.S. territory with plans to continue to do so for at least one year
- **Medical Records**: Electronic health record available and/or participant agrees to share EHR via signed release
- **Physical Evaluation/Biospecimen**: Willing to complete a baseline physical evaluation with a PMI-CP designated healthcare provider and provide urine and blood specimens
- **Participant Provided Information**: Willing to complete questionnaires on health history and health-related activities
- **Contact Information**: Willing to provide contact information and update at least annually
- **Exclusion**: Cannot be a prisoner at time of enrollment
The Program began by collecting a limited set of standardized data from sources that will include:

- Participant surveys
  - The Basics
  - Overall health
  - Lifestyle
- Electronic health records
- A baseline physical evaluation
  - Height and weight
  - Heart rate and blood pressure
  - Waste-hip circumference
- Biospecimens (blood and urine samples)

Data types will grow and evolve with science, technology, and trust.
BIOBANK

LED BY
Mayo Clinic

• Supports the collection, processing, storage, and distribution of biospecimens for research use

• This will be among the world’s largest biobanks
## PMI Sample Collection

<table>
<thead>
<tr>
<th>Type of sample and collection tube (Collection Priority)</th>
<th>Volume Collected (ml)</th>
<th>Transport T°C</th>
<th>Fraction and (number) of aliquots created</th>
<th>Aliquots -80°C</th>
<th>LN2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Clot Activator (SST)</td>
<td>8.5</td>
<td>4</td>
<td>(4) Serum</td>
<td>1.0 ml</td>
<td>--</td>
</tr>
<tr>
<td>(2) Plasma Separator (PST)</td>
<td>8</td>
<td>4</td>
<td>(4) Plasma</td>
<td>1.0 ml</td>
<td>--</td>
</tr>
<tr>
<td>(3) Na-Heparin</td>
<td>4</td>
<td>4</td>
<td>(2) WB (+DMSO)</td>
<td></td>
<td>1.0 ml</td>
</tr>
<tr>
<td>(4) EDTA</td>
<td>4</td>
<td>4</td>
<td>(2) DNA</td>
<td>0.5 ml</td>
<td>--</td>
</tr>
<tr>
<td>(5) EDTA</td>
<td>10</td>
<td>4</td>
<td>(5) Plasma (1) WBC (2) RBC (+glycerol)</td>
<td>1.0 ml</td>
<td>--</td>
</tr>
<tr>
<td>(6) EDTA</td>
<td>10</td>
<td>4</td>
<td>(5) Plasma (1) WBC (2) RBC (+glycerol)</td>
<td>1.0 ml</td>
<td>--</td>
</tr>
<tr>
<td>Urine</td>
<td>10</td>
<td>4</td>
<td>(6) Urine</td>
<td>1.0 ml</td>
<td>--</td>
</tr>
<tr>
<td>Saliva (back-up)</td>
<td>2</td>
<td>4</td>
<td>(2) DNA</td>
<td>0.5 ml</td>
<td>--</td>
</tr>
</tbody>
</table>
PMI Sample Collection

Processing steps to be done at collection sites

1. PST tube spun (room temp) within 4 hours from blood draw
2. SST tube allowed to clot for 30 minutes at room temperature, and then spun (room temp) within 4 hours from blood draw
3. Record time (time between processing and blood draw) for QC purposes
4. All tubes stored at 4°C until shipped.

Shipping

1. Samples received at Mayo within 24 hours of collection
2. Samples processed with 40 hours of collection
SAMPLE FLOW IN PMI-CP

HPOs

Biobank

Analytical Laboratories

Researchers

PTC - Direct Volunteers

Center for INDIVIDUALIZED MEDICINE
DATA FLOW IN PMI-CP

HPOs

Researchers

Analytical Laboratories

DRC

Biobank

PTC - Direct Volunteers
EMPHASIS ON SECURITY

ASSURING CORRECT PARTICIPANT IS PROVIDING SAMPLE

But no personal identifiers are transmitted to the biobank!
EMPHASIS ON SECURITY

BALANCING SECURITY AND SHARABILITY

DATA ARE BEING ENTERED IN MAYO’S SYSTEM, BUT WITH NO PII
HPO Site Workflow

- Order supplies through Mayo
- Schedule Participant
- Create Order in HealthPro Portal
- Collect specimen (post consent and PPI)
- Process
- Courier Pick-up
HPO Tube Labeling

B233481627, *
06/15/1989 16541A43B455
03/28/2017 00:00 C7035588
1ED04
Whole Blood EDTA
DV Site Workflow

- Kit Building
- Schedule Participant
- Order Kit
- Register the Kit to the Participant (HealthPro)
- Collect Specimen (post consent and PPI)
- Process
- Ship
Direct Volunteers - SCRIPPS

- Walgreens
- San Diego Blood Bank
- Quest Labs
- EMSI
- QTC

Large Companies/Labs that service vast areas. Biobank will be shipping kits to these partners.
DV Tube Labeling
- Generate labels and label tubes on site
- De-identify participants
1. Unpack
2. Quality Check
3. Accession
4. Sort for Biobank
5. Deliver to Biobank
FedEx Truck Arrives at Mayo Medical Laboratories (MML) with Berry Boxes
...placed on the conveyor
…scanned for receipt verification
Cardboard tops are cut and removed from Styrofoam
Styrofoam contents are quality checked
Specimens are distributed to accessioning stations
...sorted for Biobank delivery
…loaded onto MML truck
1. Unpack
2. Quality Check
3. Accession
4. Sort for Biobank
5. Deliver to Biobank

1. Accession
2. Sort
3. Process
4. Aliquot
5. DNA
6. Store

- Generate labels and label tubes on site
- De-identify participants
Sample Processing

- Sample Intake
  - Accessioning & Labeling

- Sample Processing
  - Hamilton Stars

- NAE
  - Autogen FLEX STAR

- Storage
  - Hamilton BiOS / Upright -80C
  - LN2
Specimens Processing

Image
Accession
Label (barcode)
Sort
Centrifuge
Aliquot
Decap

Urine, Serum (SST)
Plasma (PST)

Hamilton Star Lab Elite Liquid Handler

DNA (whole blood or saliva)

Serum, Plasma Buffy Coat, Red Blood Cells, Whole Blood

Autogen FlexStar+ DNA extraction
…for aliquotting into matrix tubes
…or loaded into Autogen FlexSTAR+ automation
…for subsequent retrieval and research
Storage

Urine, Serum (SST)
Plasma (PST)

Serum, Plasma
Buffy Coat

DNA

75% MN
25% FL

Center for INDIVIDUALIZED MEDICINE
LABVANTAGE - Information System
BACKUP AND DISASTER RECOVERY PLANNING

- 10% of freezers are left empty as backups
- Back-up generators are in place for electrical failures
- The automated storage units are equipped with liquid Nitrogen cooling capability in case of loss of power
- Multiple back-up and security systems for data
Withdrawal from the program

- Participants may withdraw at any time after completing their consent form using the Participant Portal.

- DRC will notify the Biobank within 2 business days in the form of a daily report.
  - (A) the Biobank ID of the participant
  - (B) the date of withdrawal
  - (C) whether the participant is of the Native American ethnicity

- Proper identification and retrieval of all specimen aliquots for the Biobank ID provided on the withdrawal notification.

- Disposal of all physical samples and maintaining records in the Research Lab Information Management System (RLIMS).

- Adhering to the agreed-upon process to dispose of specimens collected from participants of the Native American ethnicity in accordance to the traditions and beliefs of the Native American ethnic group.

- Authorized biobank staff will complete and sign a Sample Disposal Form. This form will be maintained in the Biobank records for documentation of request and action.
Projected goal over 5 years

Project Overall Goal

- 1 Million participants recruited
- 7 tubes per participant collected
- 34 aliquots per participants
- 34 million samples in storage

Status as of Oct 1, 2017

- 1st recruitment on May 31st, 2017
- 3,493 participants in the biobank
- 23,723 tubes processed
- 111,103 samples in storage
All of Us Research Program Biobank Team

- Stephen Thibodeau -- Co-PI
- Mine Cicek -- Co-PI
- John Maragos -- Program Manager
- Abby Willkomm -- Quality Specialist
- Mohammed Gaafarelkhalifa -- Education Specialist
- Jordan Weyer -- Supply Specialist
- Malinda Woodward -- Program Support
- Lab
  - Melanie Yrjo, Jessica Erbsen, Jessica Lesko, Amber Bridgeman, Jeff Meyer, Renee Root

- MML
  - Jeff Wills, Thomas Griffin

- RLIMS
  - Josh Spencer

- IT
  - Lori Smith, Corey Carlson

- Project Managers
  - Lab / IT  Heidi Miller
  - MML  Richard Radach
  - Space  Mark Reeping
  - Phil Plonka
  - Allie Gentry

Center for INDIVIDUALIZED MEDICINE
All of Us Research Program
The Precision Medicine Initiative

https://www.joinallofus.org