

Precision Medicine Initiative

Working Group Update

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State of the Union Address January 20th



Timing Is Everything

Nature 429, 475-477 (27 May 2004) | doi:10.1038/nature02628

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The Time Is Now

	Ten Years Ago	Now – 2014 (most recent data)
Cost of sequencing a human genome	\$22,000,000	\$1000 - \$5000
Amount of Time to Sequence a Human Genome	2 years	<1 day
Number of smart phones in the United States	1 million (<2%)	160 million (58%)
EHR Adoption (% providers)	20-30%	>90%
Computing Power	n	n x 16

Mission of the Precision Medicine Initiative

“Enable a new era of medicine through research and technology that empowers patients, researchers, and providers to work together toward development of individualized treatments.”

Elements of the PMI

- Research components
 - Expand genomics-based clinical and pre-clinical studies of cancer treatments
 - Form a national research cohort of 1M or more volunteers
- Policy needs
 - Privacy
 - Research participants protections (Common Rule)
 - Data sharing

Proposed FY16 Budget for PMI

Agency	\$ Million
National Institutes of Health <ul style="list-style-type: none">• <i>Cancer</i>• <i>Cohort</i>	\$200 \$70 \$130
Food and Drug Administration	\$10
Office of the National Coordinator for Health Information Technology	\$5
TOTAL	\$215

What Is a Cohort?



What Is a Cohort?

A group of people with a shared experience



PMI National Research Cohort

- 1 million or more US volunteers
- New model for participant engagement
 - Individuals control use of their health information
 - Genomic data, lifestyle information, biological samples – all linked to electronic health records
 - Flexibility on how and when to participate
 - Participants can be made aware of research studies of interest to them
 - Open, responsible data sharing with privacy protections



Participant Partnerships



EHRs



Technologies



Genomics



Data Science

Planning the PMI National Research Cohort

- February 11-12 NIH Hosted first Workshop
- March 30 ACD PMI WG Established
- April 28-29 Unique Scientific Opportunities for the Nat'l Research Cohort Workshop (NIH)
- May 28-29 Digital Health Data in a Million-Person PMI Cohort Workshop (Vanderbilt)
- July 1-2 Participant Engagement and Health Equity Workshop (NIH)
- July 27-28 Mobile Technologies in a Precision Medicine Initiative Cohort (Intel)

PMI Working Group of the Advisory Committee to the NIH Director (ACD)

- Charge: develop a vision for PMI and advise on design national research cohort
- Sample of Key Questions
 - Leverage existing cohorts, recruit de novo, or hybrid
 - How to capture heterogeneity in US population
 - Minimum core data elements
 - “Omics”
 - Environmental exposures
 - Behavior and lifestyle factors

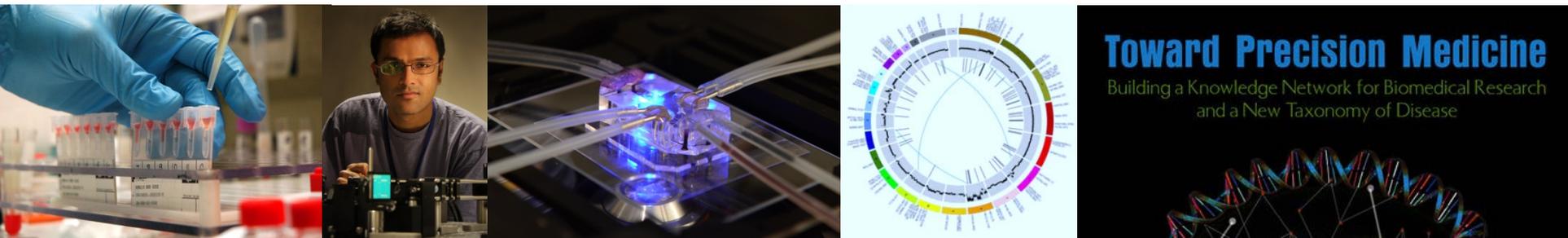


ACD PMI Working Group Members

- Tony Coles (Yumanity)
- Rory Collins (UK Biobank)
- Josh Denny (Vanderbilt)
- Susan Desmond-Hellmann (Gates Foundation)
- Eric Dishman (Intel)
- Kathy Giusti (Multiple Myeloma Research Foundation)
- Esteban Gonzalez Burchard (UCSF)
- Sachin Kheterpal (University of Michigan)
- Shiriki Kumanyika (University of Pennsylvania)
- Sekar Kathiresan (Mass General Hospital)
- Spero Manson (Colorado School of Public Health)
- Pearl O'Rourke (Partners Health Care System)
- Richard Platt (Harvard Pilgrim Health Care Institute)
- Jay Shendure (University of Washington)
- Sue Siegel (GE Ventures)
- Andrew Conrad (GoogleX)

Unique Scientific Opportunities Workshop (April 28-29)

- Visionary scientific questions that could be uniquely addressed by the PMI research cohort
- Principal workshop issues:
 - Unique opportunities presented by incorporating “omics,” environmental, and behavioral factors into cohort data collection
 - Possibilities of big health data
 - Near- and longer-term use cases for the cohort

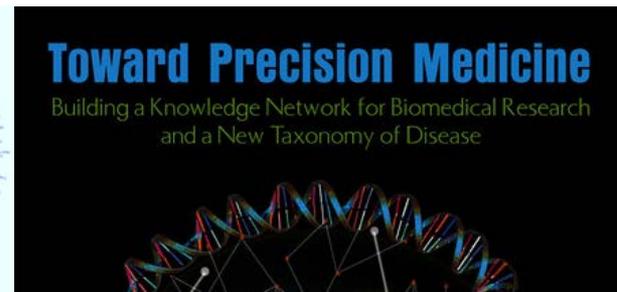
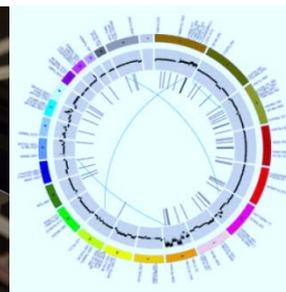
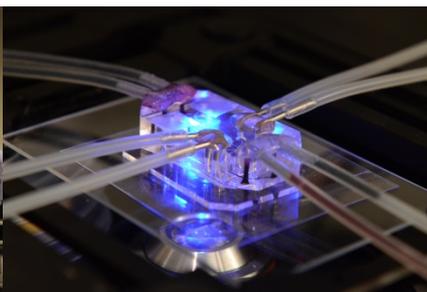


Unique Scientific Opportunities – Takeaways

- Data standards and EHR interoperability are critical to success
- Cohort design must deliver near-term and long-term outcomes
- Cohort should include both disease and healthy populations
- Designing cohort around families increases “omic” possibilities
- “Triangulate” data to dissociate correlation from causation
- Data collection priorities – chemical exposures, physical activities, and geographic and time/date stamps on the data collected
- Returning individual results and information about how and when their data are being used will increase cohort participation

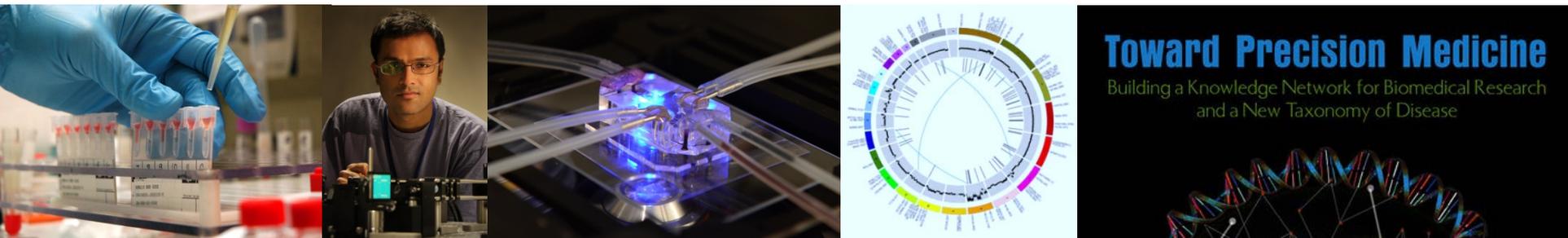
Results of Request for Information (RFI) on Building the PMI Cohort

- 1 million or more study diverse participants
- Existing studies/platforms & novel recruitment
- Maximum inclusiveness (age, ethnicity, SES, geography, rural/urban, sexual orientation)
- Follow up >5 years with varied exam interval, include core set of standardized data collection, incorporate EHR & mHealth-based strategies
- Consent with ability to re-contact
- 58 unique entities interested ... ~30 can identify & follow >10K participants

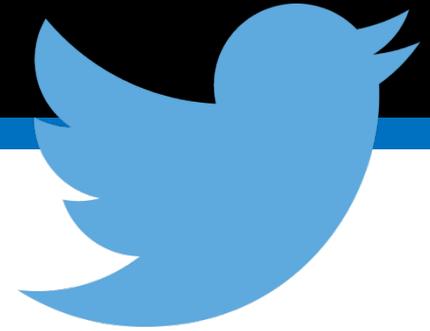


Digital Health Data in a Million-Person PMI Cohort Workshop (May 28-29)

- Principal workshop discussions
 - Existing resources NIH can leverage to build the cohort
 - Prospective ascertainment of health information
 - Baseline information and samples to be collected
 - Management of data generated by PMI
- Special guests: Sen. Lamar Alexander (R-TN) and Rep. Marsha Blackburn (R-TN)



#PMINetwork for May 28-29

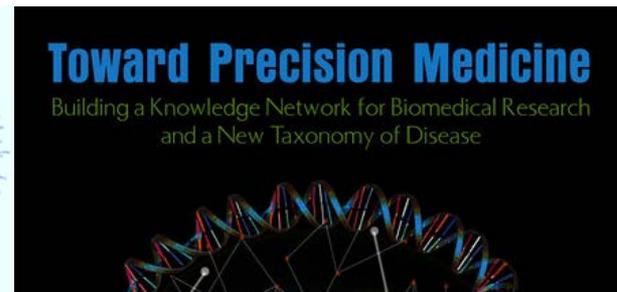
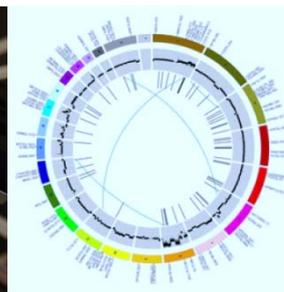
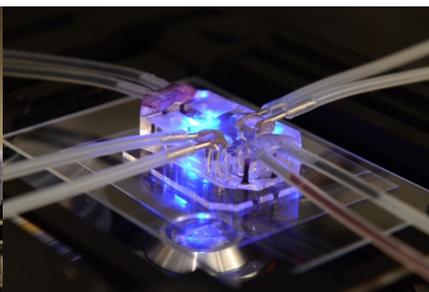


- 29,549,800 impressions
- 1,651 Tweets
- 483 people participating on Twitter

- Videocast
 - Day 1: 367 unique users
 - Day 2: 182 unique users

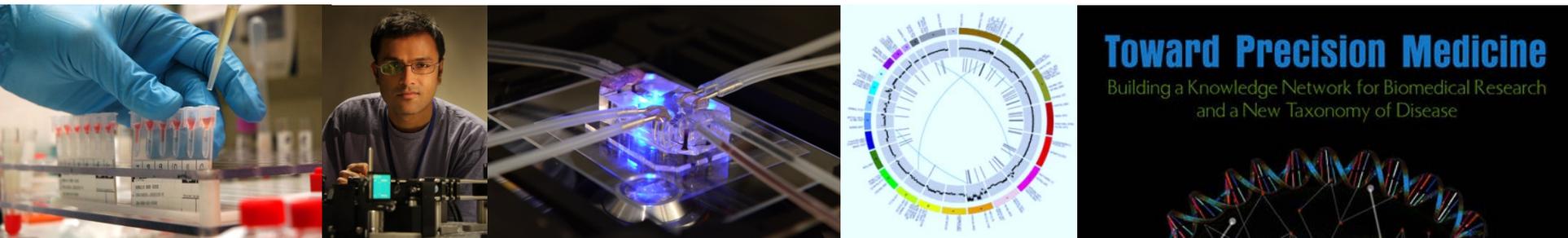
Digital Health Data in a Million-Person PMI Cohort – Takeaways

- Bipartisan support for PMI...it's time to act!
- Health care delivery organizations on board
- Data sharing and consent must be addressed
- A diverse cohort stronger than a representative cohort
- Precision medicine or precision health?
 - Need more than just EHR records
- Data curation approach critical
- Core data elements are a small number of “needs” (not “wants”)



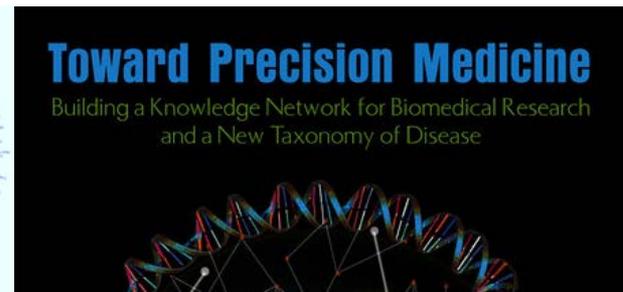
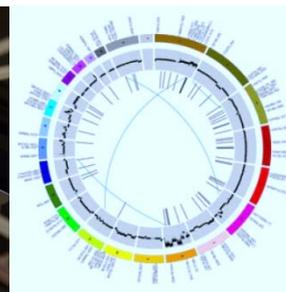
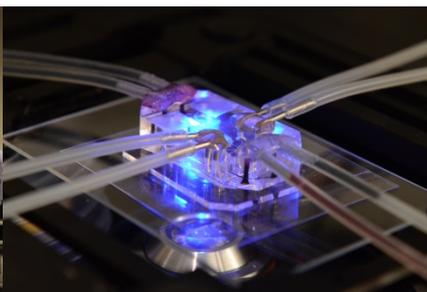
General Cohort Design Concepts – So Far

- Scientific Opportunities
 - “Early wins” will foster public interest and trust in PMI
 - Need strategies to collect a wide variety of biological and environmental data
- Design Considerations
 - Hybrid distributed and centralized data models
 - Many reasons to include children in the cohort, but may require different design considerations
 - For recruitment, balance ease of access to participants (e.g., through HC delivery organization) with diversity and inclusion
 - Healthy and disease populations must be represented



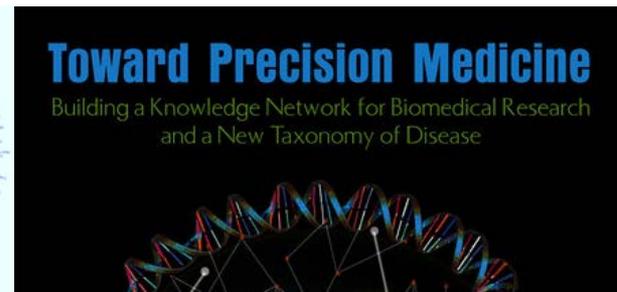
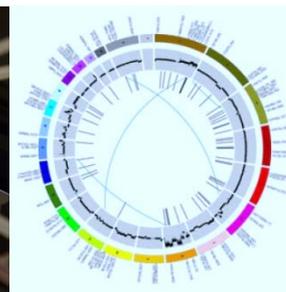
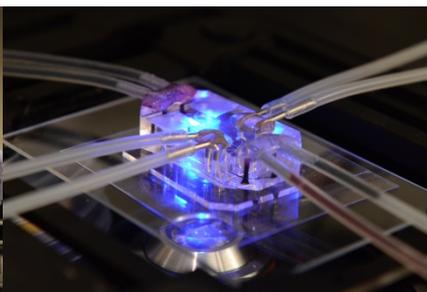
RFI on Strategies to Address Community Engagement and Health Disparities

- Strategies to enable broad and sustained participation from diverse communities (NOT-OD-15-107)
 - Building trust
 - Willingness to undergo biomedical research testing
 - Racial/ethnic differences in attitudes towards precision medicine
- Comments due June 19, 2015
- Presented at Participant Engagement and Health Equity Workshop (July 1-2)



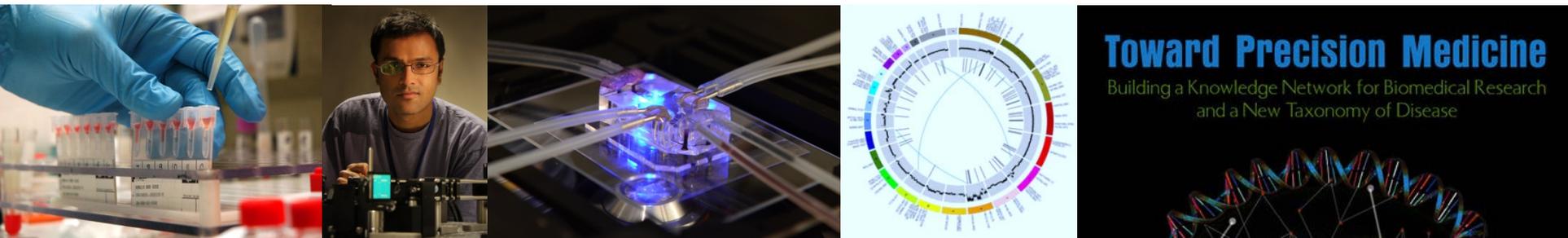
Survey on Public Preferences for Participation in a National Research Cohort

- N = 2400 respondents
 - Broadly representative of the US population
 - Oversamples Hispanic and African Americans (500 each)
- Assesses public attitudes and willingness to participate in large-scale research cohort
 - Incentives to participate
 - Data sharing
 - Informed consent
 - Participant engagement
- Results presented at on Participant Engagement and Health Equity Workshop (July 1-2)



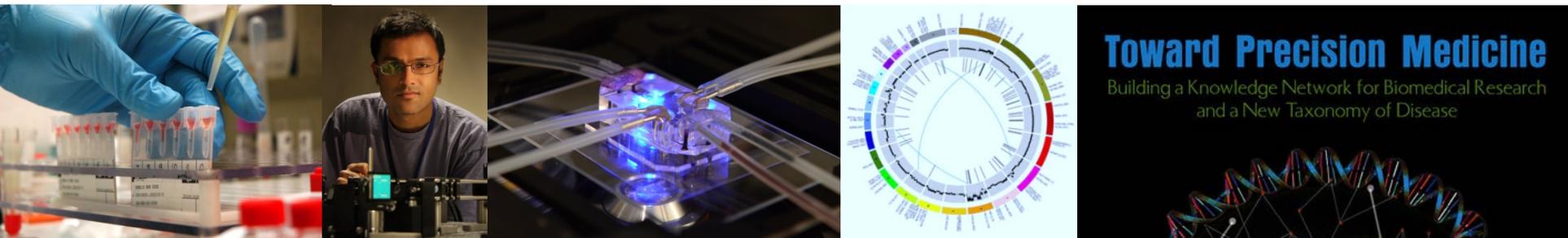
Participant Engagement and Health Equity Workshop (July 1-2, NIH)

- Principal workshop questions
 - Key design features of a participant-driven, inclusive and diverse cohort?
 - Inclusion and engagement goals and best practices for health equity?
 - How can PMI build and sustain public trust through governance, policy, and implementation?
 - What would a direct-from-participant cohort look like?
 - What should the cohort be called?
 - How to implement new models of engagement in existing cohorts?

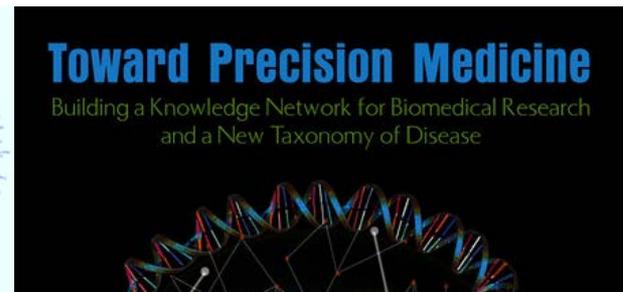
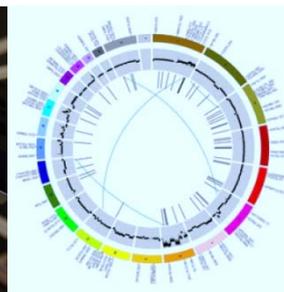
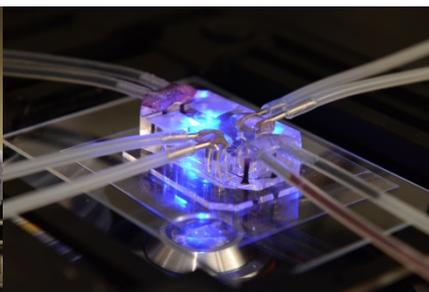


Mobile Technologies in a Precision Medicine Initiative Cohort (July 27-28, Intel)

- Scientific, methodological, and practical considerations for incorporation of mobile technologies in a PMI cohort
 - Benefits and barriers to mobile technologies
 - Scaling up for 1M or more
 - Functionalities needed for PMI successes
 - Social and technological challenges in a diverse cohort



ACD PMI Working Group Report: September 2015



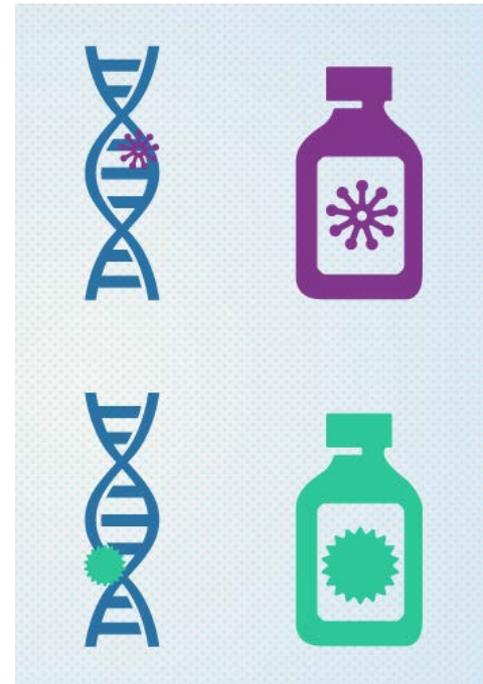
Questions?



Back Pocket Slides

Promise of PMI: New Treatments

- PMI will result in more therapies like Zelboraf™
 - Targeted to 60% of metastatic melanoma patients whose cancer contains a V600E mutation in the BRAF gene
 - doubled the survival rates in this group
- Kalydeco™ treats cystic fibrosis (CF)
 - Targeted to mutations responsible for 5% of all CF cases
 - The first CF therapy to treat the underlying cause of CF rather than just treating its symptoms
- Benefits of precision medicine can be scaled up to help more people



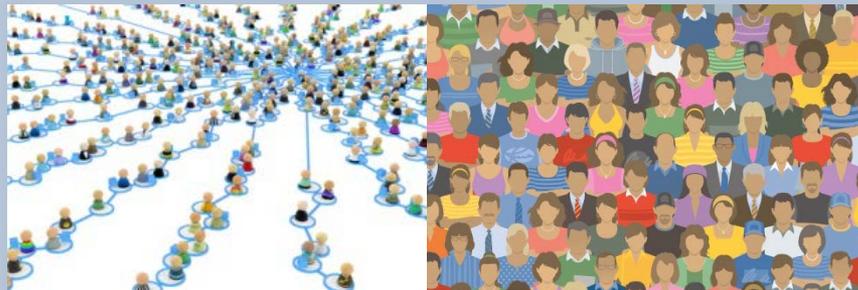
Promise of PMI: Pharmacogenomics

- **Imagine:**
 - **DNA Chip** of all known variants of pharmacogenomic relevance
 - **Provide information** to both patients and clinicians
 - **EHR for Rx** – what Rx is written
 - **Pharmacy records** – what Rx is filled
 - **Mine data** for common genetic variants
 - **Learn** what works & what doesn't
 - **Mount an interventional trial** if no one knows if the gene/drug info is really linked
 - **Dramatically expand** existing knowledge
 - FDA counts over one hundred labels with genetic info
- Apply to widely used therapeutics



Participants at the Center

- Participants engaged in design and oversight
- Participant demands that data sharing include sharing data with THEM
- Participants pushing new consent models
- User centered approach that puts the participant first
- Partnership replacing paternalism



mHealth Advances

Mobile devices can track increasing amounts of health information

- Blood pressure, pulse rate, connect with devices such as inhalers and spirometers
- Mt. Sinai Asthma Mobile Health Study, together with Apple Healthkit measures:

Symptoms

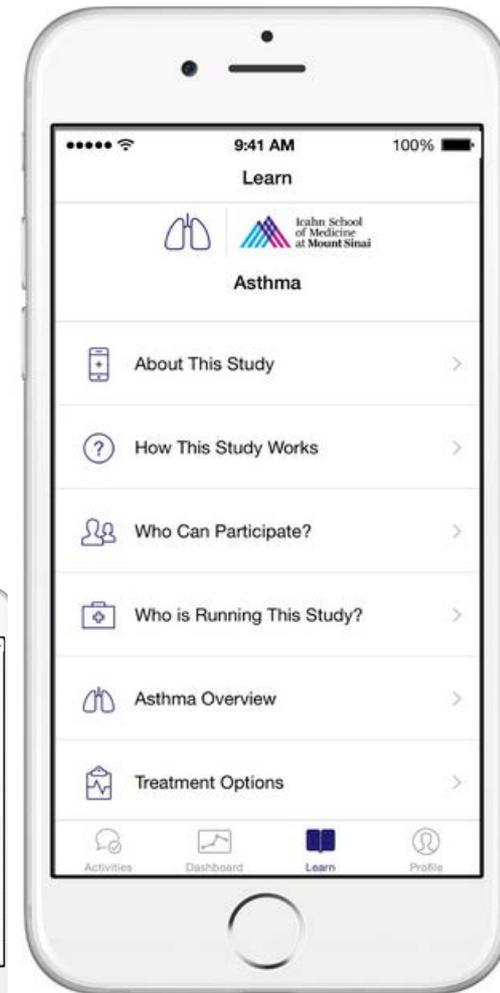
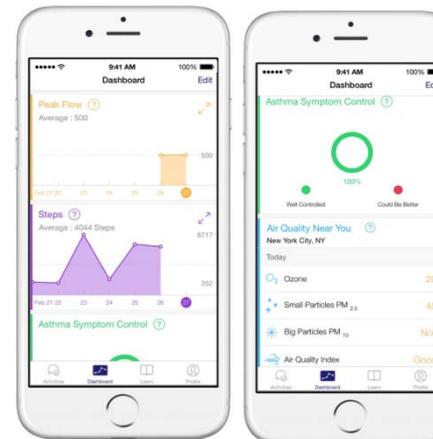
Daily activities

Environmental triggers

Peak expiratory flow

Medications

Health events



Electronic Health Records (EHRs)

- Now widely adopted
- Offers unique tools for researchers and data mining
- Research use requires agreements on data syntax, semantics, transmission methods, etc with multiple organizations who hold the EHRs



Electronic Health Records (EHRs)

- Can we put people, not institutions, in control of EHR data sharing?
- Blue-button technology promises to allow patients to download information from their electronic health record
- Promise not yet achieved but perhaps can be accelerated by leadership, resources, and patient demand
- Data could be centralized, truly enabling data science

