Wearables for Precision Health

Kay Connelly

IU Grand Challenge
Precision Health Initiative

	Genomic Medicine	Cell, Gene & Immune Therapy	Chem Biology & Biotherapeutics	Data & Informatics	Psychosocial, Behavioral & Ethics	Regenerative Medicine & Engineering
MULTIPLE MYELOMA						
TRIPLE NEGATIVE BREAST CANCER						
PEDIATRIC SARCOMA						
TYPE 2 DIABETES						
ALZHEIMER'S DISEASE						

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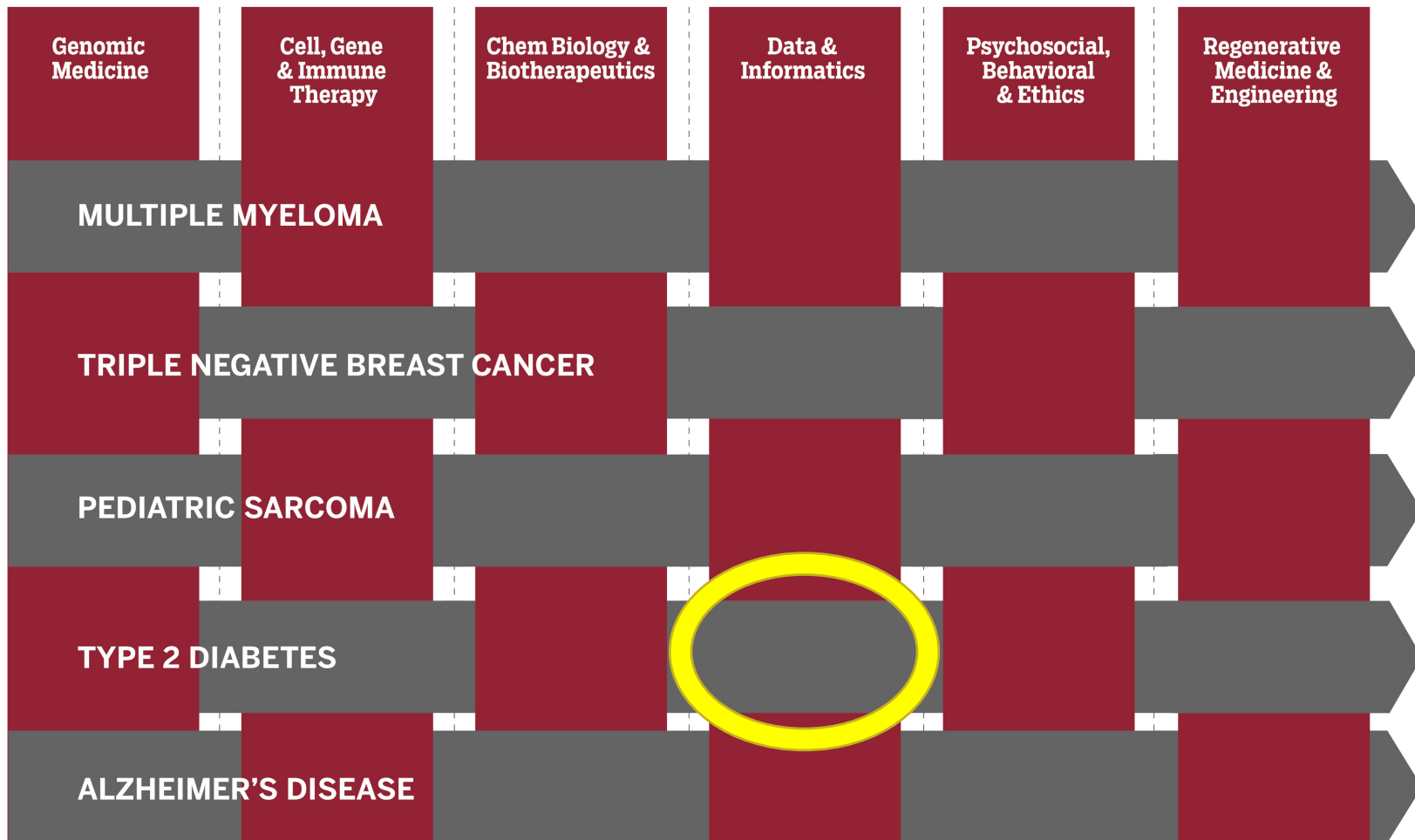
IU Precision Diabetes Program

PI's: Drs. David Haas and Kay Connelly

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Gestational Diabetes (GDM)

14% of pregnancies

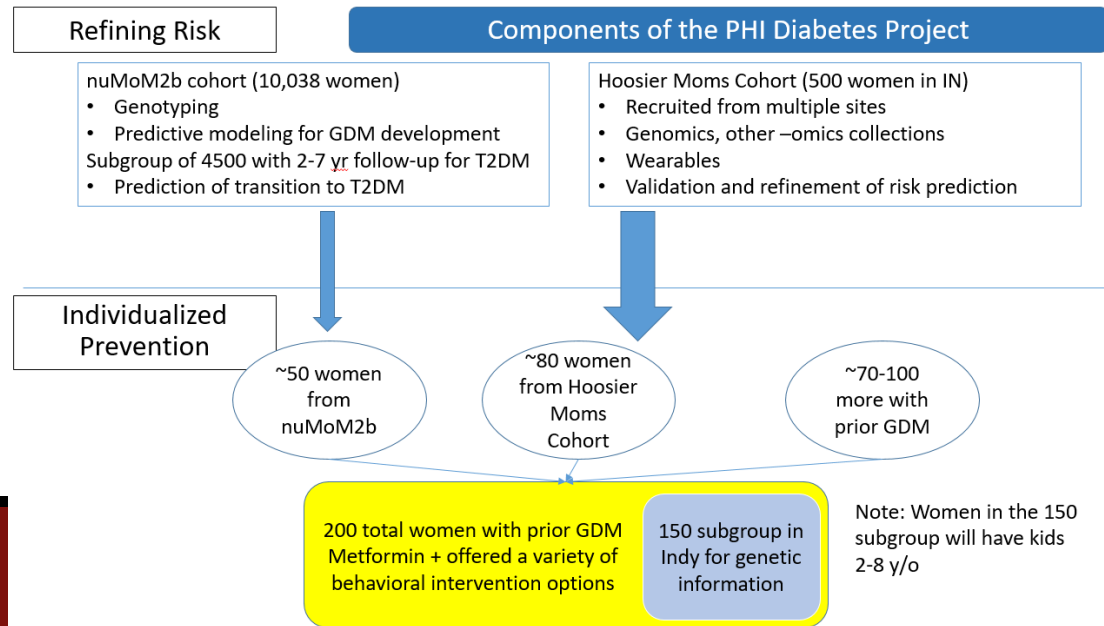**60-70% develop T2D in 5-10 years**

Phase I Overview

- **Leaders**: David Haas & Kay Connelly
- **Hypothesis**: Genetic, blood-based, and behavioral/digital biomarkers can be identified that distinguish gradations of risk for future Type 2 diabetes beyond usual clinical measures

Population	NuMoM2b Cohort	Hoosier Moms Cohort
Analysis	Biomarker Discovery	Directed refinement of discovery Tools

Target Outcomes: Provide novel discoveries regarding GDM-related diabetes risk that inform preventive care strategies regarding pathways to diabetes in this unique subset of diabetes
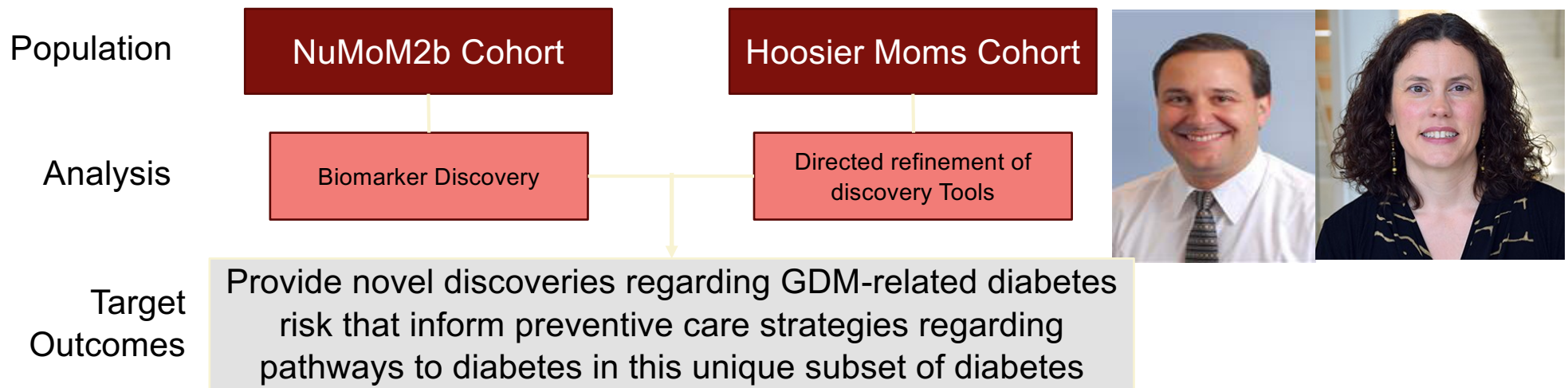
Phase II Overview

- **Leaders**: Tami Hannon & Jen Wessel
- **Hypothesis**: Genetic and other molecular information, together with psychological and sociodemographic features of the individual, can inform the delivery of prevention intervention and enhance the effectiveness and patient-centered value of these interventions
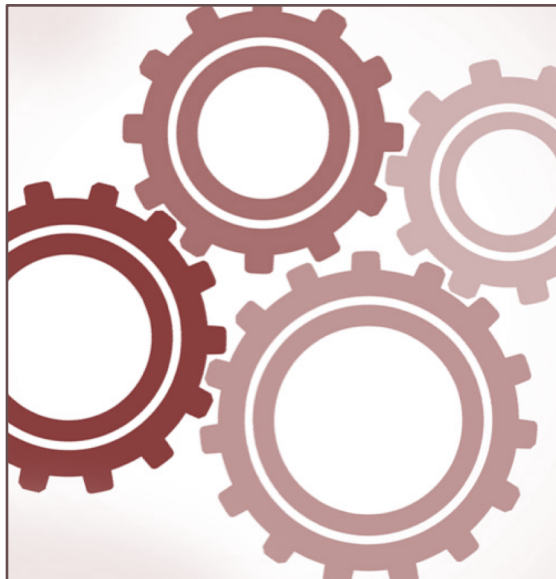
Refining Risk	Components of the PHI Diabetes Project
nuMoM2b cohort (10,038 women) • Genotyping • Predictive modeling for GDM development Subgroup of 4500 with 2-7 yr follow-up for T2DM • Prediction of transition to T2DM	Hoosier Moms Cohort (500 women in IN) • Recruited from multiple sites • Genomics, other –omics collections • Wearables • Validation and refinement of risk prediction

Individualized Prevention

~50 women from nuMoM2b

~80 women from Hoosier Moms Cohort

~70-100 more with prior GDM

200 total women with prior GDM Metformin + offered a variety of behavioral intervention options

150 subgroup in Indy for genetic information

Note: Women in the 150 subgroup will have kids 2-8 y/o

Behavioral Data: Wearable… But Which One?

Analog

Battery

Activity & Sleep

Viewability

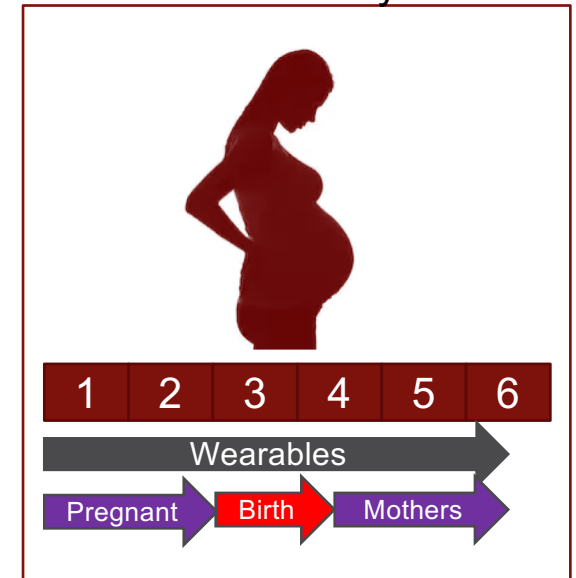Synching

Behavioral Data: Wearable… But Which One?

Evaluation Framework

Usability Study

Pilot Study
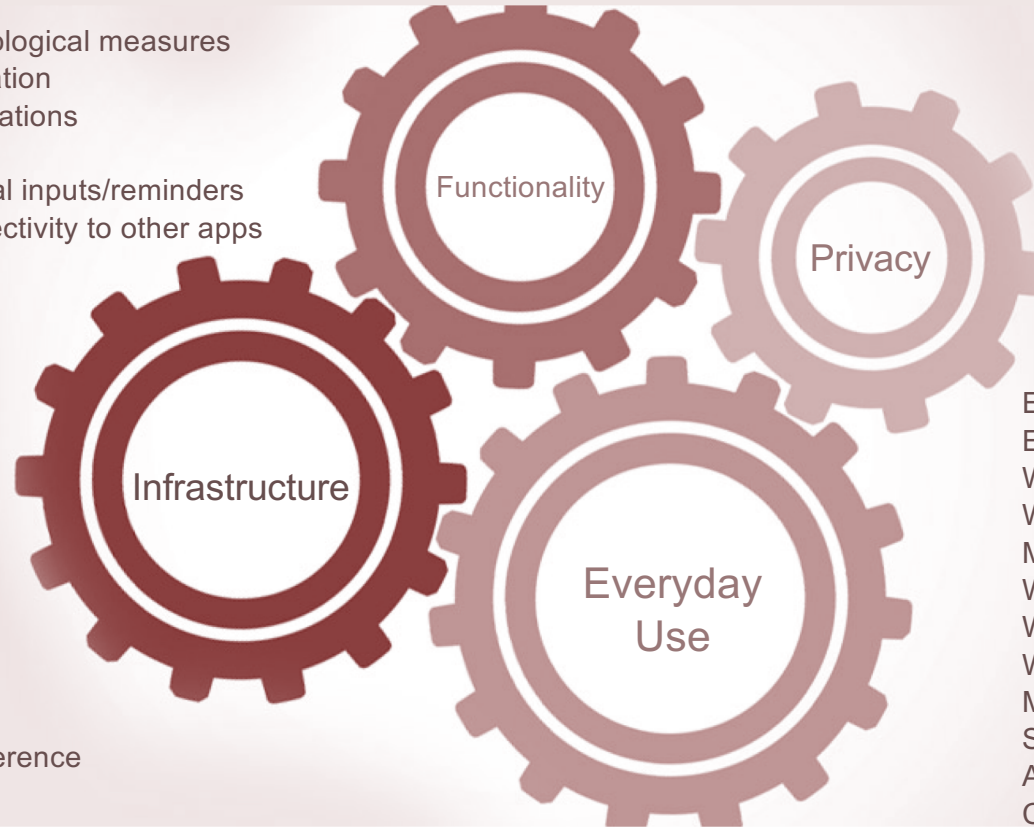
Narrowing Selections - - - - → Final Selection - - - - → Testing & Understanding Use

Evaluation Framework

Physiological measures
Motivation
Notifications
Clock
Manual inputs/reminders
Connectivity to other apps

Functionality

Privacy

Infrastructure

Everyday Use

Ease of setup
Ease of physical controls
Wearable display viewability
Wearable display interpretability
Mobile app ease of use
Wearability
Water Resistance
Wearable device battery
Mobile battery
Syncing
Aesthetics
Customization

Device/data access
Cost
API: data
API: scalability
API: notification
API: maturity
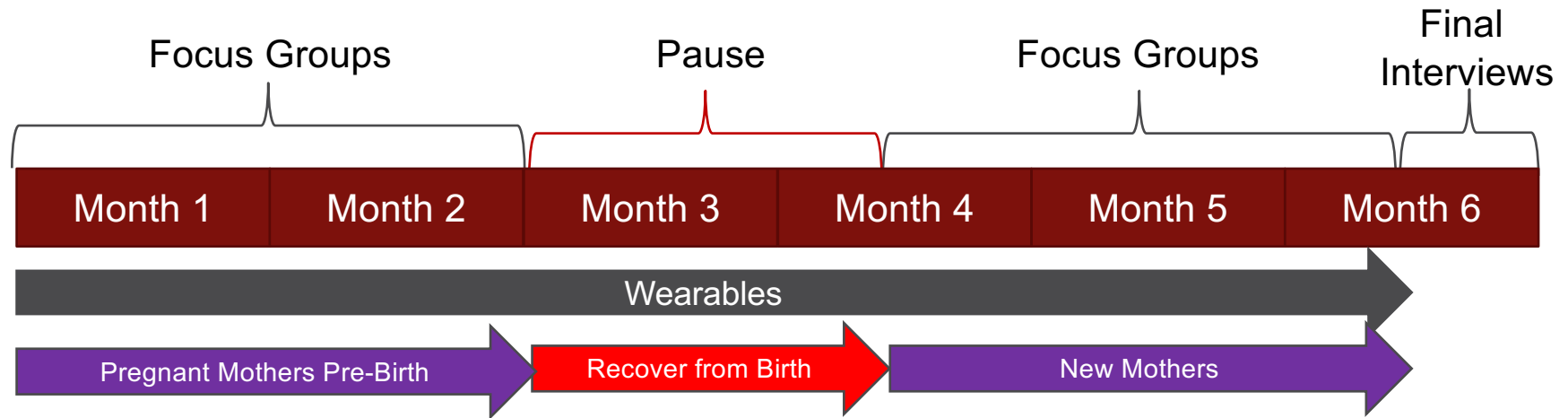Open source/API reference
Developer support

Narrowing Selections

- Identified 10 devices at proper cost point (<$150)

- Prioritized features for women of young children (e.g. active lifestyle => battery life, water proof, etc…)

- Narrowed to 3 devices:

Usability Study

tasks

preferences

Garmin Vivosmart HR

Pilot Study

Focus Groups Pause Focus Groups Final Interviews

Month 1	Month 2	Month 3	Month 4	Month 5	Month 6

Wearables

Pregnant Mothers Pre-Birth → Recover from Birth → New Mothers →

- 38 participants, 8 weeks before & after birth
- Wearable feedback: Did they like the form? Features? App?
- Wearable usage: Did they wear it? Charge it? Synch regularly?
- Did the feedback or usage change pre/post birth?

Pilot Study: Major Findings

Form Factor

"The only issue thus far has been that it is a bit bulky/unnatural feeling to wear. I am not in the habit of wearing bracelets, watches, etc., so I have found it particularly noticeable. I have been removing it at night for comfort, so have not been able to take advantage of sleep monitoring." [A007]
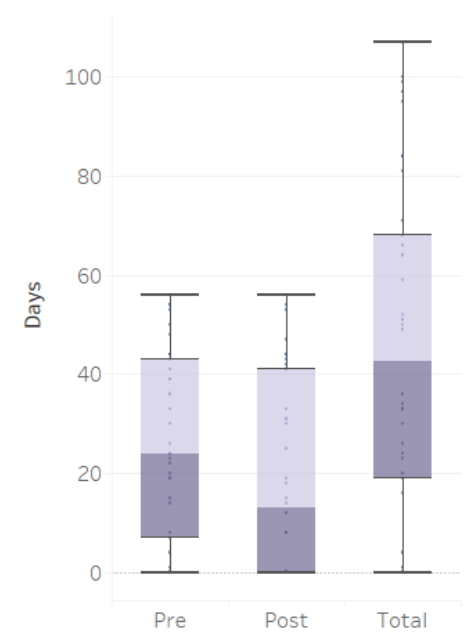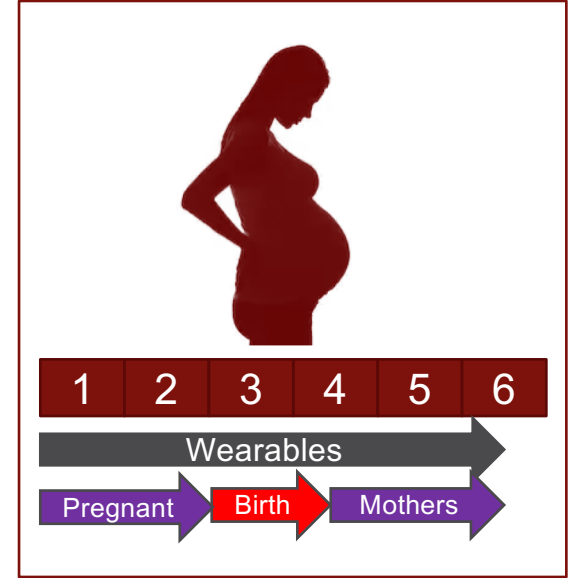
Pilot Study: Major Findings

Post Pregnancy Use

- Drop in usage post-pregnancy

- Participants noted being "too busy" and/or "too tired" to be exercising

- Viewed device to be an exercise tracker rather than a lifestyle tracker

Average Total Usage Days

Phase I Overview

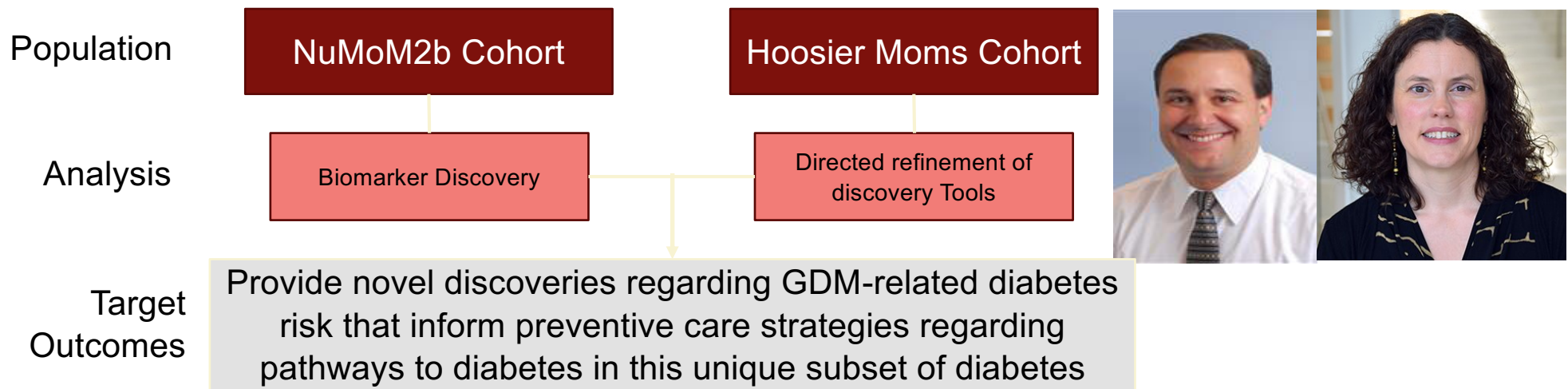- **Leaders**: David Haas & Kay Connelly
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Population		
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Analysis

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Target Outcomes

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GDM Models

- NuMoM2B
  - EHR+survey models being produced now
  - Genomic data added in fall
- Hoosier Mom's Cohort
  - 500 women recruited in their first trimester
    - ➔ Current recruitment at n=50
  - Data:
    - EHRs, surveys, genomics
    - + food diaries, wearables
  - Model with behavioral data >1 year out
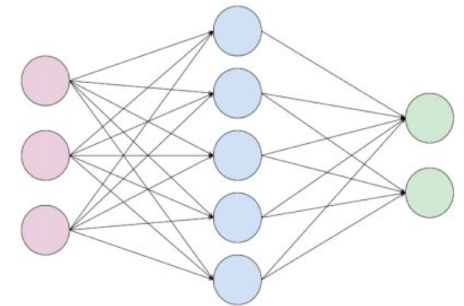
Questions?

Collaborators: Katie Siek, Cassie Kresnye, Haley Molchan, Rashmi Bidanta, Novia Nurain

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