Design & scope of ongoing & Future Collaborations: The Framingham Heart Study

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No Conflicts to Disclose
Framingham Heart Study
Longitudinal Community-Based Family Study

Original cohort N = 5209 men and women (ages 28-62)
1644 spouse pairs, 596 extended families

Offspring cohort N = 5124

Omni study 1, N = 506

Third Gen cohort N~4000, New Offspring Spouses, N=100
1576 spouse pairs, 3514 biological offspring

Omni study 2, N~400
Framingham Heart Study

- Longitudinal
  - Lifetime measures & Lifestyle measures
  - Lifetime risk
  - Trajectories, cumulative exposure, temporal trends

- Deeply Phenotyped
  - FHS is ~ The Human Phenome Project

- Extensive Genetic/Genomic Resources
  - Unique tissue resources

- Family-based study
FHS: Dense Phenotypic Characterization

Dementia
Stroke
Cardiac
Pulmonary
Vascular
Osteoporosis
Osteoarthritis
Alcohol
Transcriptome
Methylome
Proteome
Metabolome

Cancer
Depression
Eye
Hearing
Renal
Vascular
Diabetes
Endocrine
Aging
CMS

The Human Phenome Project

Now...Waiting for collaborations!!
Genomic Resources

- Marshfield genome scan (~400 markers/every 10cM)
- GWAS: 100K, 550K imputed to 1000K, 5M Omni
- Exome Chip Illumina v1.0
- Whole Exome Sequences
- Whole Genome Sequences
- MediSeq
- Candidate genes/SNPs
- iPS cell lines soon

Access locally if working at BU
Or through dbGaP
SABRe CVD Initiative: Resources

- High-throughput technology to measure
  - Project 1: Discovery proteomics, metabolomics & lipomics
  - Project 2: Targeted immunoassays
  - Project 3: Gene expression profiling
  - Project 4: microRNA profiling

<table>
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<tr>
<th>Gene Expression</th>
<th>Methylome</th>
<th>Metabolome</th>
<th>miRNA</th>
<th>Protein Biomarkers*</th>
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<td>5,622</td>
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<td>2,650</td>
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*170 immunoassay proteins.
Framingham Heart Study Biorepository

- Core mission: Preservation, tracking/distribution and appropriate utilization of biological specimens collected from FHS participants

- Compilation and QC of resulting measures for submission to central databases (dbGaP and BioLINCC) and for use by investigators
FHS: roads less travelled!

- Environmental epidemiology
- Social epidemiology
- Infectious disease epidemiology
- Epidemiology Methods development
AHA CVGPS

NHLBI

NIA, NIDDK, Other NIH Agencies

FHS

Core Completed R01s

New Cohort F

Industry

New Cohort J

JHS

Core Completed R01s

AHA

Active R01s

BU

Active R01s

UM
Positioning FHS for the future

• Beyond etiological research: translation, implementation, dissemination
• Greater data access
• Extend cohorts across lifecourse & for multiple outcomes
• Novel technologies
• Integrate big data
• Knowledge integration into practice & policy
• Training the workforce for this millennium
• Optimize use of resources for best return on investments
FHS changes in a Brave New World

- **Culture**
  - Collaborative
  - Transparent

- **Science**
  - Futuristic
  - Transdisciplinary

- **Processes**
  - Streamlined
  - User-friendly

- **Organizational**
  - National resource
  - Self-sustaining in resource constrained environment
Collaborations: Challenges & Opportunities

- Standardization of traits
  - ‘analysis-ready; distributed datasets

- Joint leadership
  - Framework and collaborations (lessons from genetics)

- Funds to jump-start projects

- Protecting ESI across studies
Collaborations: Some Questions?

• Foster collaboration while maintaining uniqueness?

• Foster innovation while working towards harmonization?

• Synergies with precision medicine initiative?

• How to bridge gap between genetic & non-genetic collaborations?