BIOLOGICAL MEASURES
IN THE HEALTH AND RETIREMENT STUDY

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HRS WORKING GROUPS FOR BIOLOGICAL MEASURES

• Biomarkers
  • Eileen Crimmins, Jessica Faul, Bharat Thyagarajan

• Genetics
  • Sharon Kardia, Jennifer Smith, Jessica Faul, Wei Zhao, Erin Ware, Colter Mitchell

• Health
  • Eileen Crimmins, Jessica Faul, Ken Langa, Bob Wallace

• Also extensive collaboration with USC-UCLA Biomarker network:
  • Teresa Seeman, Jung-Ki Kim, Perry Hu, Steve Cole, Heather McCreath, Alan Potter
**WHY**

Biological measures are of interest in studies of aging human populations for

- Improved accuracy over self-report of health status and behaviors related to risk of disease or care needs
- Measurement of biological factors in the pathway between social/environmental exposures and outcomes of aging
- Measurement of biological factors external to that pathway that may constrain its operation (e.g., “pure” biological differences in risk, some forms of GxE)
BRIEF HISTORY

• No biomeasures before 2002
• Two supplement studies 2002-04
  • ADAMS – ApoE
  • Diabetes study – HbA1c
• Major redesign I in 2006: Enhanced FTF Interview
  • Physical and performance measures
  • Saliva samples for DNA
  • Dried blood spots for assays
• Half-sample rotation
EFTF INTERVIEW

• Physical and performance measures
  • Blood pressure
  • Height, weight, waist circumference
  • Puff test, grip strength, balance test, timed walk (65+)
  • HearCheck hearing test (2016)
• Saliva (Oragene) for DNA
• Blood spots (2006-16)
  • HbA1c, CRP, Cystatin-C, Total and HDL cholesterol
  • IL-6 (2014, 2016)
HRS – GENETIC DATA PRODUCTS

• Full GWAS+exome data deposited at dbGaP
  • 254 authorized user groups
  • Slow to add data
• Polygenic scores
  • Robust construction methods, shared with other studies
  • Can be done for any trait with good published GWAS, not just those you measure (in fact you don’t want to use GWAS results that include your study)
  • (relatively) up to date on HRS sample and published literature
• Distributed by HRS
MAJOR REDESIGN II IN 2016: VENOUS BLOOD

- Venous blood collection by contract phlebotomists in separate visit starting in 2016
- Goal is one draw per respondent every six years
- Repository the primary destination; some essential assays as part of initial collection, others as funding permits
- Dried blood spots dropped from EFTF starting 2018
HRS Venous Blood Collected – 50.5 mL

Collection

3 X 10 mL SST

Field Centrifugation

8 mL

CPT

10 mL

EDTA

PAXgene RNA

Lab Processing and Assaying

Serum

Serum

Serum

Flow Cytometry

Cryopreservation

CBC

Lab Centrifugation

Assays

Assays

Storage

15 Aliquots – 0.5 mL Serum

9 aliquots of Cryo-preserved Cells
(1 x 2M, 4 x 1M, 4 x .5M)

6 aliquots – 0.5 mL Plasma & DNA

10 aliquots – Stabilized RNA
VBS Assays from 2016 Supplement

Assays released December 2017, full sample (n~9900)
  • Metabolic Panel, Lipid Panel, CBC
  • CRP, Cystatin C, Ferritin, DHEA-S, CMV, B-type natriuretic peptide

Completed Assays - In QC, being prepared for release, full sample
  • Flow cytometry
  • Cytokines (IL-6, IL-1RA, IL-10, TNF-alpha, sTNFR-I and TGF beta [activated form])
  • Insulin-like growth factor (IGF-1)
  • Vitamin D

Innovative sample (n~4,100)
  • DNA methylation (Illumina EPIC)
  • Telomeres
  • RNA Seq
  • mtDNA copy number
  • Homocysteine, Clusterin, Brain-derived Neurotrophic Factor (BDNF)
Good source for more information: user guides on HRS website
https://hrs.isr.umich.edu/documentation/user-guides

• Biomarkers
  • Crimmins EM, Faul JD, Kim JKi, Weir DR. Documentation of Biomarkers in the 2010 and 2012 Health and Retirement Study.

• Cognition
  • Ofstedal MB, Fisher GG, Herzog AR. Documentation of Cognitive Functioning Measures in the Health and Retirement Study
  • Weir DR, Langa KM, Ryan LH. 2016 Harmonized Cognitive Assessment Protocol (HCAP) Study Protocol Summary

• Mortality follow-up
  • Weir DR. Validating Mortality Ascertainment in the Health and Retirement Study