

Preliminary Dried Blood Spot Biomarker Data from the Study on global AGEing and adult health (SAGE)

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Talk outline

- Aging and chronic disease in LMICs
- Dried blood spots (DBS)
- WHO's Study on global AGEing and adult health (SAGE)
- Preliminary biomarker data from SAGE Wave 1
- Ongoing and future biomarker research in SAGE

Aging and health in LMICs

- Population aging recognized as a global issue yet data primarily available for wealthy nations
- Yet, massive epi and demographic changes in LMICs, with population aging and increased NCDs
- Most international development not targeted on NCDs
- Much of NCD burden preventable or modifiable but data needed to inform health system responses



BusinessWeek magazine
January 30, 2005

Dried blood spots (DBS) from finger prick

- Minimally invasive, field friendly tool for documenting health and physiology
- Unravel complex relationships between social and biological determinants of health
- Test models of aging
- But, methodological issues need to be addressed in order to realize the potential of this powerful tool (DBS 2.0)



Shuar Health and Life History Project
(Morona-Santiago, Ecuador)

Study on global AGEing and adult health (SAGE)

- Data collection platform on older adults (50+) with younger sample (18-49); $n = >42,000$
- Longitudinal study of 6 countries at different development levels
- W0 & W1 complete, W2 in process (2015), W3 planned (2017)
- Data designed for comparison with HRS, ELSA, CHARLS, LASI



Wan et al. 2012. *Shades of Gray*. US Census Bureau

See Kowal et al. 2012. *Int J Epidemiology* for data resource profile paper on SAGE

Today's objectives

1. Present preliminary SAGE biomarker data from Wave 1
2. Discuss ongoing and planned work for SAGE Waves 2 & 3



Preliminary biomarker data – Methods

- DBS samples from ~38,000 Wave 1 respondents
- Transported to central national labs for storage and analysis
- Standard protocol and training
- Wave 1 DBS samples assayed for a core set of biomarkers
 - Hb
 - HbA1c
 - CRP
 - EBV antibodies
 - HIV



SAGE 2010 lab training
(Durban, South Africa)

Preliminary biomarker data – Results

- Funding not available for all biomarkers in all countries but results from 5 countries and >70,000 analyses

Preliminary sample sizes for five DBS biomarkers, by country, SAGE W1

	CRP	Hb	HIV	HbA1c	EBV
China	7508	9581	Pending	5703	No
Ghana	Pending	2194	2634	Pending	Pending
India	5139	10,816	No	832	3406
Mexico	Pending	Pending	Pending	Pending	Pending
Russia	1431	1349	706	1001	1289
South Africa	3500	3600	2985	3160	3917
Total, n	17,578	27,540	6325	10,696	8612

Glycated hemoglobin (HbA1c) – Methods

- HbA1c results from DBS assay on Beckman Coulter Synchron platform developed in ZAF
 - Validation with 100 matched samples
 - Whole blood %A1c highly correlated to DBS %A1c ($r=0.97$)
 - Modest glycosylation over 3 months ($<10\%$)
 - Inter-lab comparison with 57 DBS samples from LASI analyzed in SAGE ZAF lab. ZAF lab values showed excellent agreement with India (NARI) lab results ($r=0.94$)
 - Williams et al. in prep. *Am J Hum Biol.*

HbA1c – Select preliminary results

- Diabetes underdiagnosis & disease management among older adults
- **Aim #1:** Evaluate self-report diabetes status accuracy
 - **India (n = 812)**: ~81% of men, 86% of women with no previous diabetes diagnosis had HbA1c levels $\geq 6.5\%$
 - **ZAF (n = 3356)**: Using $\geq 6.5\%$ cutoff, drastic underestimation of diabetes prevalence based on SR
 - SR: 7% in men and 10% in women
 - HbA1c: 85% for both sexes
 - With modified cutoff ($>7\%$ HbA1c): $>50\%$ prevalence for both men and women

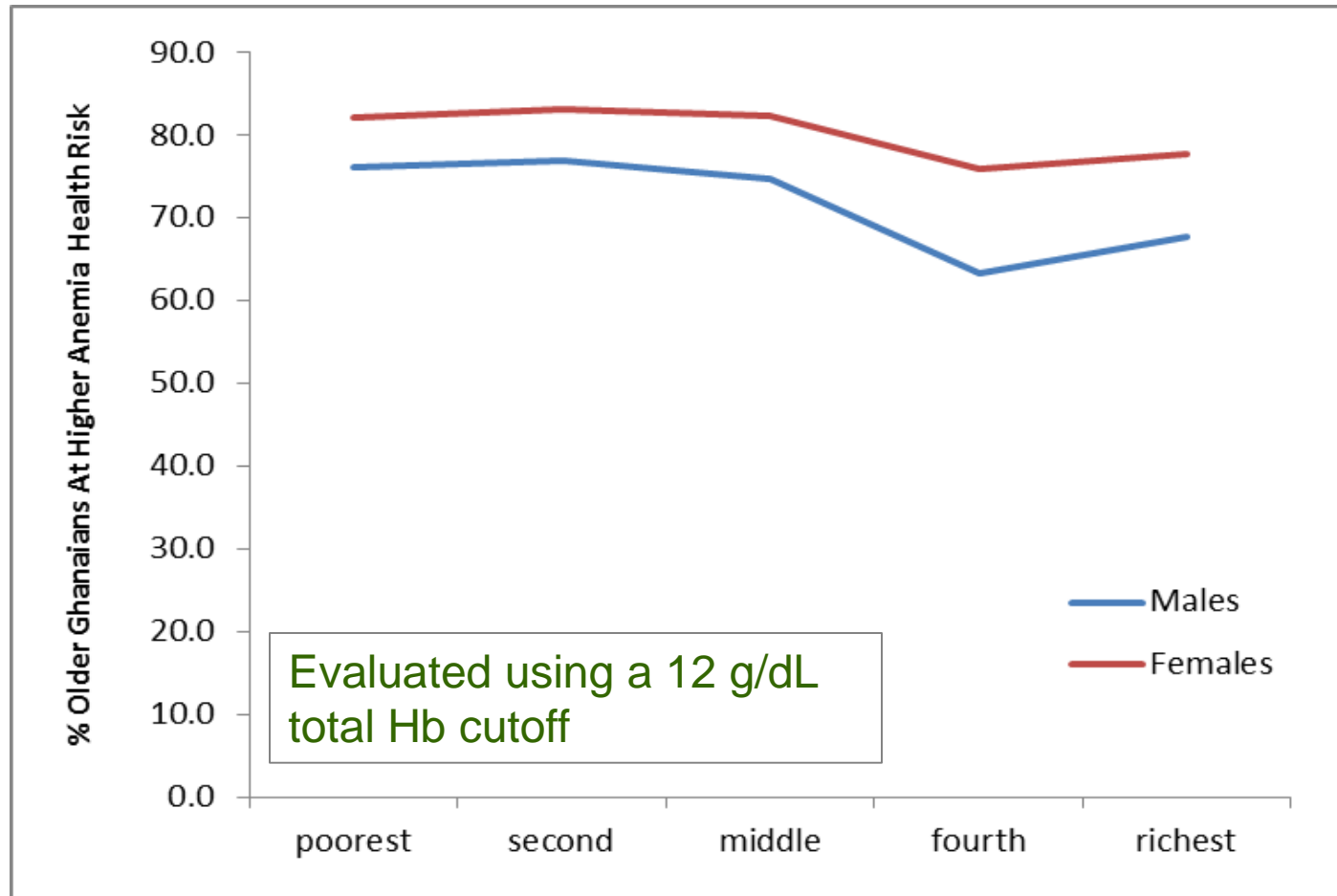
HbA1c (cont'd)

- **Aim #2:** Consider whether childhood socioeconomic position affects HbA1c among older adults in China
 - Methods: Participants with elevated HbA1c ($\geq 6.5\%$) age- and sex- matched 1:4 to controls with normal HbA1c (688:2752)
 - Results: High adult education had a higher risk for abnormal HbA1c (OR=1.23[95%CI: 1.09-1.39]), and physical inactivity (OR=1.38[95%CI: 1.11-1.71]) and high BMI (OR=1.11[95%CI: 1.02-1.22])
 - High parental education and adult education were risk factors of elevated HbA1c in older adults in China independent of adult health conditions.

Hemoglobin (Hb)

- DBS results based on modified Drabkin's method
- Evaluate anemia in Ghana; 1265 participants, ~76% high risk, especially elevated in women (80% vs. 71%)

- Highest two wealth quintiles have the lowest burden but still extremely high overall



C-reactive protein (CRP)

- CRP used modified hsCRP DBS assay from McDade et al., 2004. *Clin Chem*.
 - Serum-equivalent values calculated based on McDade et al. 2012. *Am J Hum Biol*.
- **Aim:** Evaluate elevated CRP in ZAF and Russia

	% Low Risk (<1 mg/L CRP)	% Average Risk (1-3 mg/L CRP)	% High Risk (>3 mg/L CRP)	n
South Africa				
Women	44.4	28.8	26.8	1968
Men	43.2	29.1	27.7	1464
Russia				
Women	5.3	53.8	40.9	171
Men	6.9	52.8	40.3	159

~27% in ZAF with high risk CRP, and ~40% in the small Russian sample

HIV

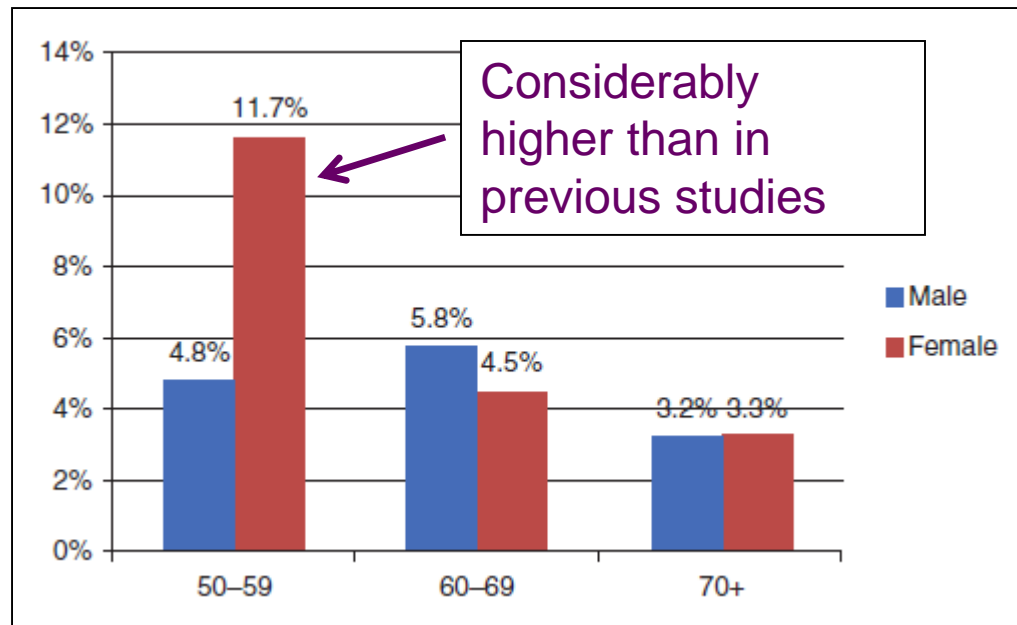
- Analysis using DBS ELISA method from ZAF, with confirmation using alternate measure
- **Aim:** HIV prevalence and risk factors in Ghanaian older adults
 - N = 1669
 - HIV+ rate for adults aged 50-plus is ~2.3%, with higher rates in women and urban dwellers
 - Provides much needed prevalence data for older adults

Characteristic	HIV-positive (%)	N
Sex		
Male	1.9	830
Female	2.4	839
Age group		
50-59	2.3	663
60-69	3.0	463
70+	1.3	543
Residence		
Urban	2.6	764
Rural	1.8	905
Marital status		
Never married	0	16
Currently married	2.3	873
Cohabiting	5.0	20
Separated or divorced	2.4	292
Widowed	1.7	458

HIV

- Aim: Prevalence of HIV among older ZAF adults
 - ZAF data available for 3839 older adults (findings published in Negin et al. 2012. *AIDS*)
 - Results: HIV prevalence was 6.4% and was particularly elevated among women aged 50–59 and those living in rural areas

- HIV-infected older adults in South Africa have high rates of chronic disease and weakness



Ongoing and future SAGE biomarker studies

- Clean W1 data and publish
- Wave 2 collection ongoing – NIH funding request pending for W2 & W3 analyses
- Cross-lab harmonization & methods development— New and revised DBS assays
- Allostatic load: Multi-system dysregulation (HbA1c, apoB, IL-6, CRP, CyC, TL)



Filming CRP video assay protocol
(<http://www.bonesandbehavior.org/sage/>)

Acknowledgments

We thank the SAGE study participants, the study PIs and field and lab teams, as well as the Eugene200 study staff and participants

Study sponsor: NIH R01-AG034479 & NIA Interagency Agreement YA1323-08-CN-0020

