

Study Name: Indonesia Family Life Survey (IFLS)

- **PI:** John Strauss
- **Biological data personnel:** Perry Hu, Eileen Crimmins, John Strauss, Henny Herningtyas
- **General design:** Longitudinal cohort study
 - wave 1 (1993-1994, over 22,000 individuals from 7,224 households), wave 2 (1997-1998, re-contact rate: 94.4%), wave 3 (2000, re-contact rate: 95.3%), wave 4 (2007-2008, re-contact rate: 93.6%), wave 5 (2014-2015, re-contact rate: 92%)
- **Demographics:** national sample, representing about 83% of the Indonesian population

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- **Survey domains:**

- Household and individual surveys, including consumption, income, assets, education, migration, labor market outcomes, marriage, fertility, contraceptive use, health status, use of health care and health insurance
- Community/facility survey, including physical and social environment, infrastructure, employment opportunities, food prices, access to health and educational facilities, and the quality and prices of services available at those facilities

Existing biomarkers

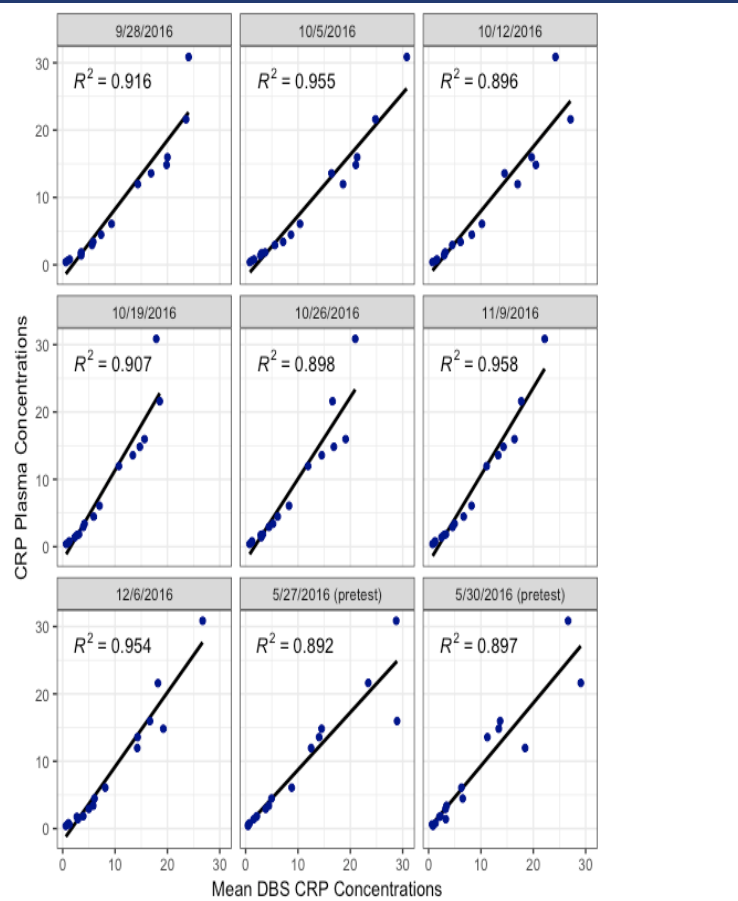
- **Blood based biomarkers from dried blood spot (DBS) specimens or point-of care tests (POCT)**
 - Hemoglobin (waves 2, 3, 4, 5)
 - Total and HDL cholesterol (wave 4)
 - hsCRP (waves 4 and 5)
 - HbA1c (wave 5)
- **Non-blood based biomarkers**
 - Anthropometric measurements: height, weight, waist and hip circumferences, knee height, upper arm length
 - Blood pressure, lung peak flow, grip strength, timed sit-to-stand, timed walk, and balance measures

Lessons Learned

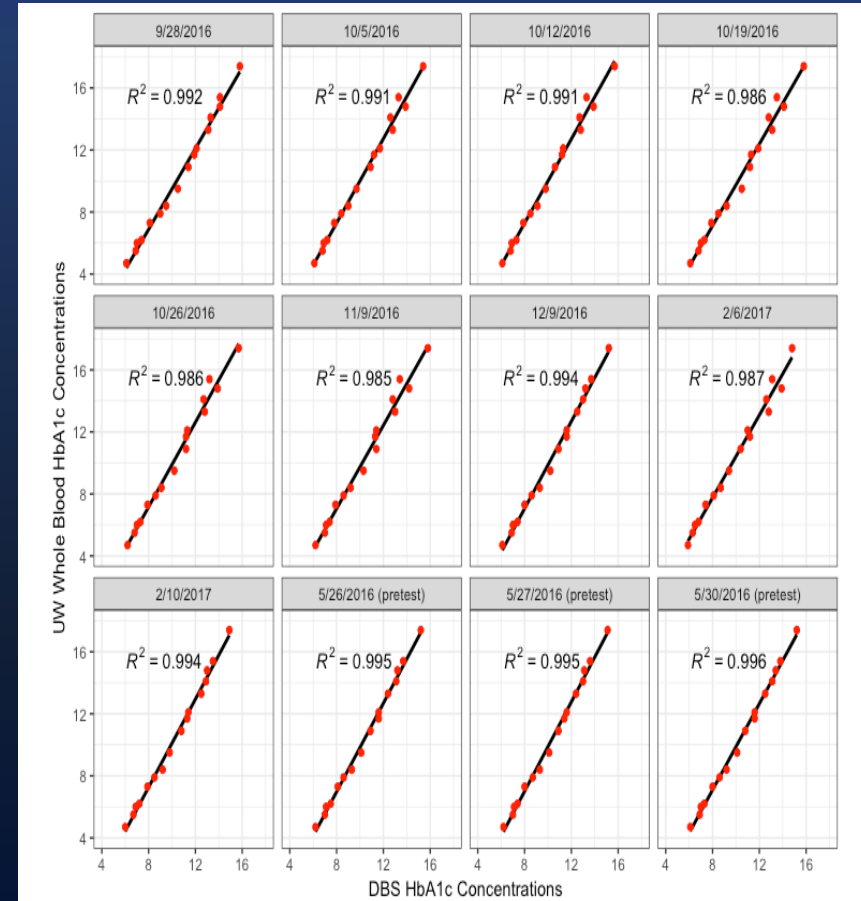
- **With proper training and quality control, high quality DBS-based CRP and HbA1c assays may be implemented successfully in countries outside the U.S.**

Results from repeated measurement of quality control samples over time

CRP



HbA1c

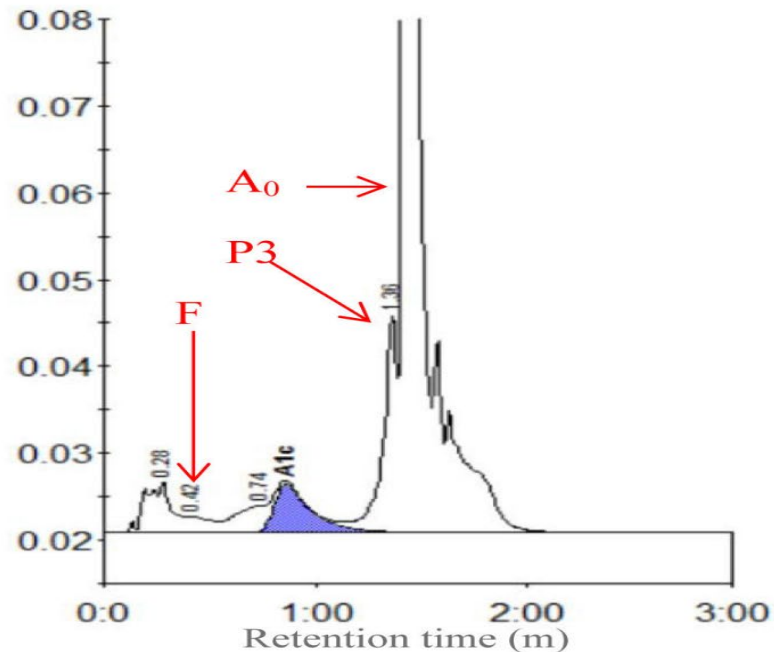


Lessons Learned

- **Always expect the unexpected** – the example of falsely elevated diabetes prevalence rate estimate
- DBS-based HbA1c assay was performed on Bio-Rad D10 analyzer, which uses high performance liquid chromatography (HPLC) methodology
- HPLC separates out different components of hemoglobin at a specific time, based on electric charges
- The concentrations of hemoglobin components are measured as they are released from chromatographic column and plotted against retention time, producing a chromatogram

Information from chromatograms

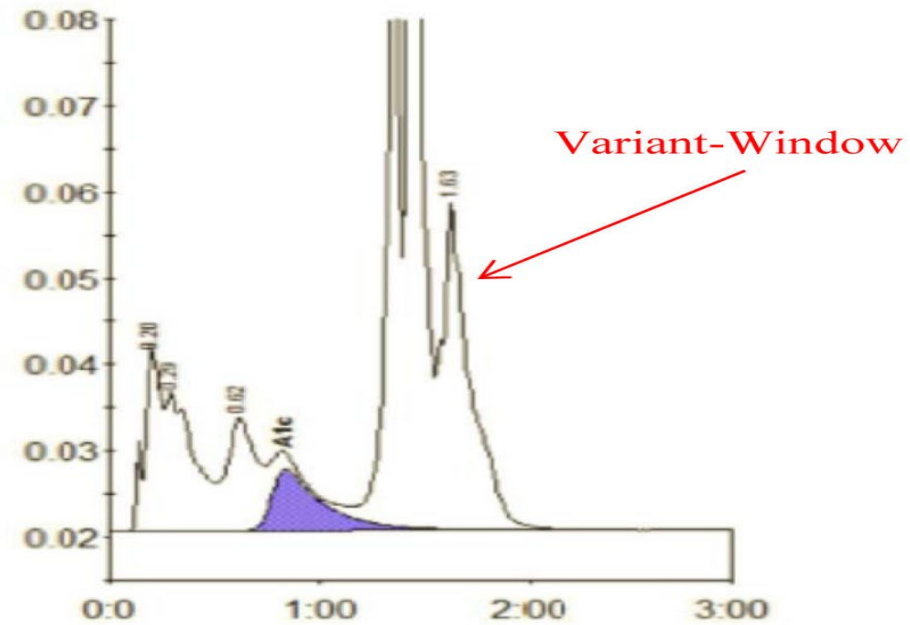
A. Well-determined example



Peak table

Peak	R.time	Height	Area	Area %
A1b	0.28	5960	52031	2.9
F	0.42	1892	14055	0.8
LA1c/CHb-1	0.74	3044	31473	1.7
A1c	0.86	5575	68225	4.9
P3	1.36	24926	111745	6.2
A0	1.42	414461	1527441	84.6
Total Area:			1804971	
A1c				4.9%

B. Example with problem Hb variant



Peak table

Peak	R.time	Height	Area	Area %
A1a	0.20	21380	115863	5.9
A1b	0.29	16006	153686	7.9
LA1c/CHb-1	0.62	13016	128495	6.6
A1c	0.84	7086	120006	10.0
P3	1.36	78154	342514	17.5
A0	1.44	201748	791851	40.6
Variant-Window	1.63	38262	300091	15.4
Total Area:			1952505	
A1c				10%

Lessons Learned

- Characteristics of the reliquified blood from DBS caused the HPLC to identify the peak at the shoulder of A0 as a hemoglobin variant when, in fact, it is part of A0 density function
- Under this assumption, we recalculated A1c as a percentage of total hemoglobin, taking into account sample-specific chromatogram information, which decreased diabetes prevalence estimate from about 50% to 10%
- We have not been fully delineated the DBS characteristics that have caused hemoglobin variant on chromatogram, but believe they should be related to DBS collection, drying, and shipping processes (e.g. temperature, humidity)

Proposed Biomarkers from stored samples

- None

Future plan – wave 6

- **Blood based biomarkers from dried blood spot specimens and POCT**
 - to be determined
- **Non-blood based biomarkers**
 - Anthropometric measurements: height, weight, waist and hip circumferences, knee height, upper arm length
 - Blood pressure, lung peak flow, grip strength, timed sit-to-stand, timed walk, and balance measures