Proteomic profiling of the English Longitudinal Study of Ageing cohort

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English Longitudinal Study of Ageing

- **PI:** Prof Andrew Steptoe, UCL
- **Design:** bi-annual face-to-face interviews and nurse visits
- **Survey Domains**: 15 modules
- **Linkage to**: Hospital Episode Statistics; NHS Central Register (mortality and cancer); National Insurance contributions; Benefits (including State pensions and tax credits); Tax records; Private pensions; Air Pollution

Summary of Data collection W1-10

Year	Modality	Sample	Refreshment
Wave 1 (2002/3)	CAPI	12,099	
Wave 2 (2004/5)	CAPI + Nurse visit	9,432 (7,666)	
Wave 3 (2006/7)	CAPI + Life History	9,771 (7,855)	HSE 2001/02/03/04
Wave 4 (2008/9)	CAPI + Nurse visit	11,050 (8,643)	HSE 2006
Wave 5 (2010/11)	CAPI	10,274	
Wave 6 (2012/13)	CAPI + Nurse visit	10,601 (8,054)	HSE 2009/10/11
Wave 7 (2014/15)	CAPI	9,666	HSE 2011/12
Wave 8 (2016/17)	CAPI + Nurse visit (50%)	8,445 (3,525)	
Wave 9 (2018/19)	CAPI + Nurse visit (50%)	8,736 (3,069)	HSE 2013/14/15
Covid-19 (2020)*2	Online + CATI	~7000	
Wave 10 (2022/23)			

Sample sizes are all completed interviews; **CAPI** = computer assisted personal interview; **CATI** = computer assisted telephone interview; **HSE** = Health Survey for England; **Wave 1** = Original sample interviewed in HSE 1998/1999/2001, age 50+ on 1 Mar 2002

Physical Examination and Performance data

	Wave 2	Wave 4	Wave 6	Wave 8	Wave 9	Wave 11
Sitting Height	✔	✔	✔			
Standing Height	✔	✔	✔			✔
Weight	✔	✔	✔	measured at the interview	measured at the interview	✔
Waist circumference	✔	✔	✔			
Hip circumference	✔	✔				
Blood pressure	✔	✔	✔	✔	✔	✔
Lung function	✔	✔	✔			✔
Leg raise	✔	✔	✔			
Chair rises	✔	✔	✔			
Balance	✔	✔	✔			✔
Tandem stand	✔	✔	✔			
Grip strength	✔	✔	✔	✔	✔	✔

Blood assays

Blood Assays	W2	W4	W6	W8	W9	W11
Triglycerides	✔	✔	✔	✔	✔	✔
Total, LDL and DHL - cholesterol	✔	✔	✔	✔	✔	✔
C-reactive protein, fibrinogen	✔	✔	✔	✔	✔	✔
Apolipoprotein E (APOE)	✔					
Mean corpuscular haemoglobin		✔	✔			
Haemoglobin and ferritin	✔	✔	✔	✔	✔	✔
White blood cell count		✔	✔	✔	✔	✔
Fasting glucose, glycated haemoglobin	✔	✔	✔	✔	✔	✔
Insulin-like growth factor 1 (IGF-1)		✔	✔	✔	✔	✔
Vitamin D			✔	✔	✔	✔
DNA extraction and storage	✔	[✔]	[✔]	[✔]	[✔]	[✔]
Cortisol and Testosterone (saliva or hair)	✔		✔			✔
RNA Paxgene tubes				✔	✔	✔

Cells in square brackets [✔] - only for refreshment sample or those who had not undertaken previously.

Genetic Data

- Genome-wide association study (GWAS) was conducted on 7,597 ELSA participants (100% White). After quality checks, analytical sample was 7,223 with 1,374,524 genotyped SNPs

- Polygenic Scores were built using PRSice and PLINK 1.9.
  - PGS was based on directly genotyped data rather than imputed data
  - GWAS summary statistics used for the phenotypes included personality types, physical health, reproductive behaviours, socio-economic and behavioural traits, and psychopathology

Proteomic profiling

- Proteomics is the large-scale study of proteomes, i.e. a set of proteins produced in the organism

- Proteomics is used to investigate:
  - when and where proteins are expressed
  - rates of protein production, degradation, and steady-state abundance
  - how proteins are modified

- Proteomics can provide significant biological information, including involvement in biological processes and prediction of diseases before symptoms onset.

In ELSA

- Olink proteomic platform which uses multiplexed antibody-based immunoassays with quantitative PCR to measure panels of proteins
- Olink provides a high-throughput multiplex immunoassay product that allows the detection of 184 protein biomarkers using only 1 µL of blood sample without compromising assay performance.
- PEA technology (proximity extension assay)
  - High sensitivity and specificity

Practical Considerations

- The Olink proteomic platform is currently being used for proteomic analysis of ~8,000 participants in the National Child Development Study (the 1958 British Birth Cohort Study).

- The Olink platform is also going to be used in a project involving 3,500 stored samples from the HRS (that will further enhance comparability).

- Proteomic analysis using Olink is also planned for UK Biobank

Procedure

- ELSA will assay EDTA samples collected in 2004 (W2) and 2008 (W4).

- The blood samples are not collected in an ideal way for protein analysis.

- According to the Olink team protein biomarker panels for cardiovascular and cardiometabolic and neurological studies are not compromised

- Frozen samples will be sent to Olink for aliquoting, plating, and assays (including built-in technical validation & quality control procedures)

What to expect

- Nurse visits procedures for blood sample collection
  - Strict eligibility criteria
  - Fasting check
  - Obtain oral and written consent
    - to take a blood sample; to send results to general practitioner; to store blood; and to extract and store DNA

- 5800 (Wave 2) and 6200 (Wave 4) blood samples taken, received, with sufficient and 'usable' blood ~7000 expected

- By end of 2023

More Info

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