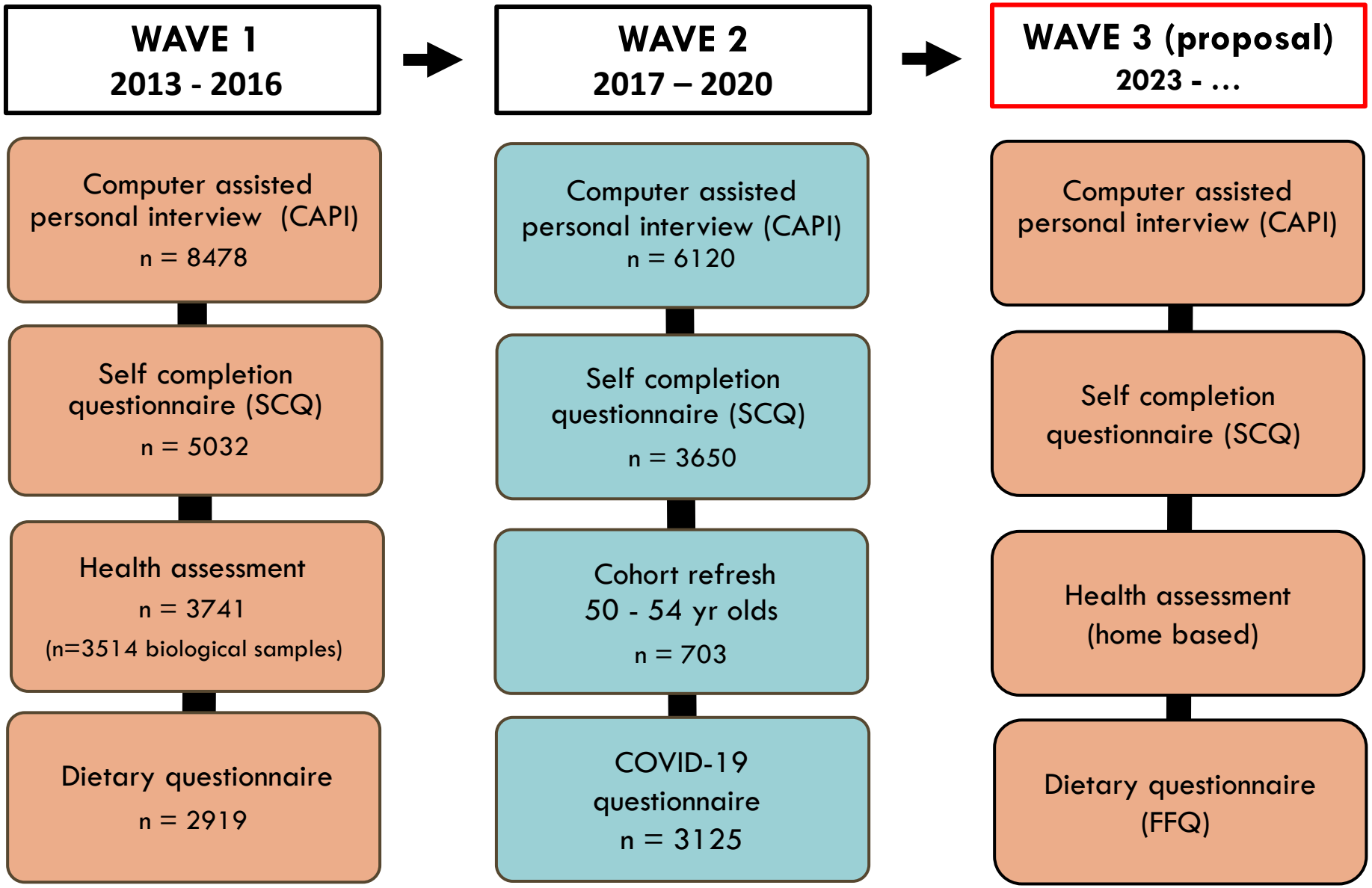
Prof Bernadette McGuinness
Queen's University Belfast

Context - Stages of NICOLA Data Collection



EXISTING MEASURES (WAVES 1 AND 2)

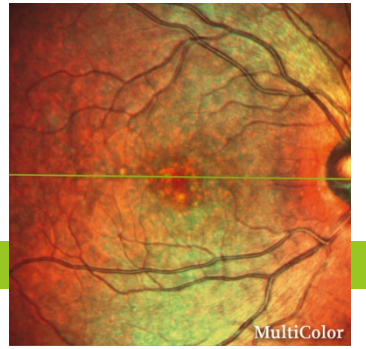
CORE TOPICS	Wave 1	Wave 2	New questions included within topic at Wave 2
Demographics	√	√	Parental status and history
Transfers to children	√	√	
Physical and cognitive health	√	√	Oral health, disability, HADS, CASP-19 and QOL-BREF
Life events, trauma, stress	√		
Personality	√		
Help and helpers	√	√	
Employment	√	√	Subsidiary work, job satisfaction
Healthcare utilisation	√	√	A&E visits, A&E outcomes, healthcare satisfaction
Health behaviours / lifestyle	√	√	Sexual/romantic intimacy
Medications	√	√	
Work and pensions	√	√	
Social connectedness	√	√	Culture and Arts activities
Income and assets	√	√	
Expectations	√	√	
Social participation	√	√	Housing and transport
Social capital	√	√	
COVID-19		√	

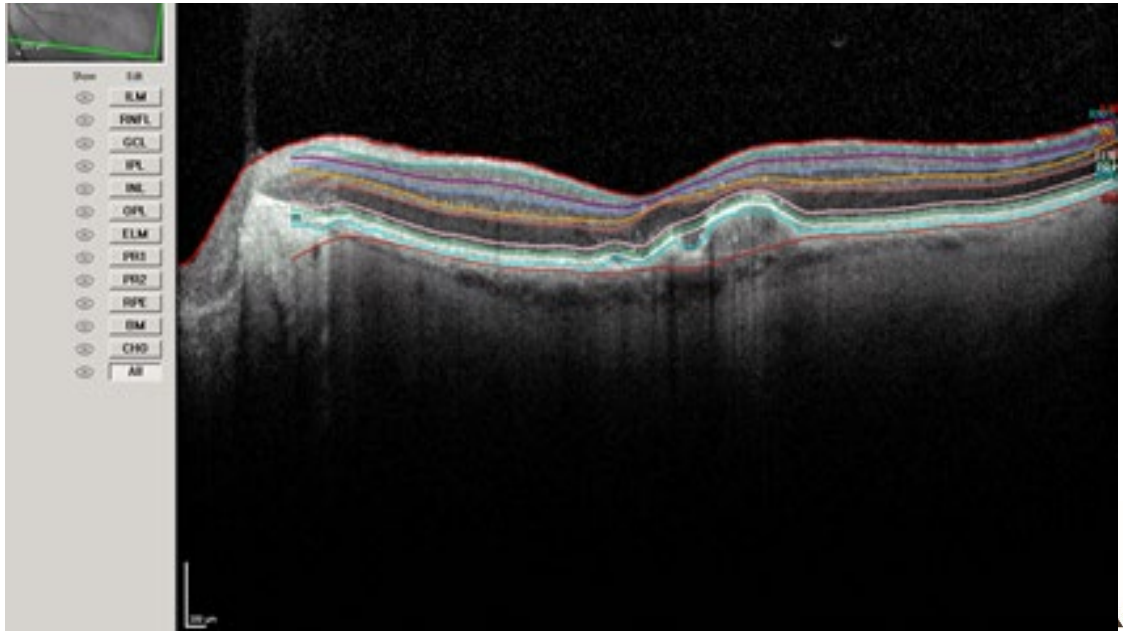
Retinal Imaging

- **Colour fundus Photographs**
- **Wide field colour images (TX200)**
- **OCT:** Infra-red retinal image
  Multi-Colour image
  Blue-autofluorescence
  Dual wavelength AF movie
  OCT

Multimodal imaging

- enables more accurate phenotyping for earliest stages of age-related macular degeneration
- enables prevalence data of new phenotypes and associated risk factor analysis





Biochemical biorepository

Economic and Social Research Council
Shaping Society

Lab 1: Total Chol, HDL, LDL, triglycerides, blood glucose, HBA1c, vitamins (A,C,E)

Lab 2: Core UK Biobank panel including for example:

- Cholesterol
- Direct LDL
- HDL-cholesterol
- Triglyceride
- Apolipoprotein A
- Apolipoprotein B
- C-reactive protein
- Lipoprotein (a)

- Vitamin D
- Rheumatoid factor
- Alkaline phosphatase
- Calcium
- SHBG
- Testosterone
- Oestradiol

- Glucose
- Cystatin C
- Creatinine
- Total protein
- Urea
- Phosphate
- Urate
- Albumin

Lab 3: Genetic, epigenetic and transcriptomic data (Infinium CoreExome-24 Array) incl. Apolipoprotein E (APOE) genotyping and genome-wide association summary statistics for ~30 phenotypes

NICOLA

Genetic repository

- 3,266 unique samples genotyped at 551,839 single nucleotide polymorphisms (SNPs) using Infinium CoreExome-24 Array
- 551,839 directly genotyped and 18,148,478 imputed from 1kGP3 and HRC reference panels
- Apolipoprotein E (APOE) genotyping
- Individual Genome-Wide Association summary statistics for ~30 phenotypes
- RNA sequencing planned

Ampliseq S5 prime sequencer

EDTA tubes

Lab processing and assaying

DNA storage aliquots -80˚C

NICOLA associated research

LifePath Consortium (2015 – 2019)

Horizon 2020
European Union Funding
for Research & Innovation

- Aim of LIFEPATH: To investigate the biological pathways underlying social differences in healthy ageing
- Meta-analysis of epigenome-wide association data
- Analysis of NICOLA methylation data

Other genomic collaborations:

- Genetic Investigation of Anthropometric Traits (GIANT)
- Global Lipids Genetic Consortium (GLGC)

www.aging-us.com AGING 2019, Vol. 11, No. 7

Research Paper

Socioeconomic position, lifestyle habits and biomarkers of epigenetic aging: a multi-cohort analysis

THE GERONTOLOGICAL SOCIETY OF AMERICA
Journals of Gerontology: Biological Sciences
cite as: J Gerontol A Biol Sci Med Sci, 2022, Vol. 77, No. 9, 1750–1759
https://doi.org/10.1093/gerona/glac041
Advance Access publication February 17, 2022
OXFORD

Original Article

The Role of Epigenetic Clocks in Explaining Educational Inequalities in Mortality: A Multicohort Study and Meta-analysis

Kidney Disease Genetics Consortium

- With increasing incidence and a prevalence of >10 % among adults worldwide, chronic kidney disease (CKD) represents a major public health issue
- A better understanding of the genetic basis of kidney function may provide important insights into the disease
- NICOLA is one of several population based cohorts coordinating EWAS for kidney disease
- Part of worldwide consortia for genome-wide genotype data (CKDGen)
- GEnetics of Nephropathy: an International Effort (GENIE) consortium

Harmonizing Cognitive Assessment Protocol (NICOLA-HCAP)

- Aims to investigate dementia risk using a harmonised cognitive assessment protocol as part of a larger NIA funded study
- NICOLA, TILDA, Health & Retirement Study (HRS), ELSA
- 1000 NICOLA participants aged 65 yrs and over
- Cognitive and neuropsychological assessments to discriminate between normal cognitive performance, cognitive impairment and dementia
- This work will:
  - generate an extensive global dementia bioresource
  - produce internationally comparable data

SPACE: Supportive environments for Physical and social Activity, healthy ageing and CognitivE health.

Healthy Ageing Challenge
Social, Behavioural and Design Research

Economic and Social Research Council

- Where we live may influence brain health and vulnerability to cognitive impairment

- Research questions:
  - Are there specific factors which make urban environments a problem for brain health ?
  - What are the best policies and interventions for promoting healthy ageing and brain health for our poorest communities ?

- SPACE research package included:
  - collecting physical activity data using Actigraph accelerometers
  - monitoring location and travel via GPS devices
  - analysis of environmental factors in relation to brain health

SPACE
SUPPORTIVE ENVIRONMENTS FOR PHYSICAL & SOCIAL ACTIVITY, HEALTHY AGEING & COGNITIVE HEALTH

SPACE factsheets / videos

Noise and Light Pollution

Noise Pollution Factsheet

Light Pollution Factsheet

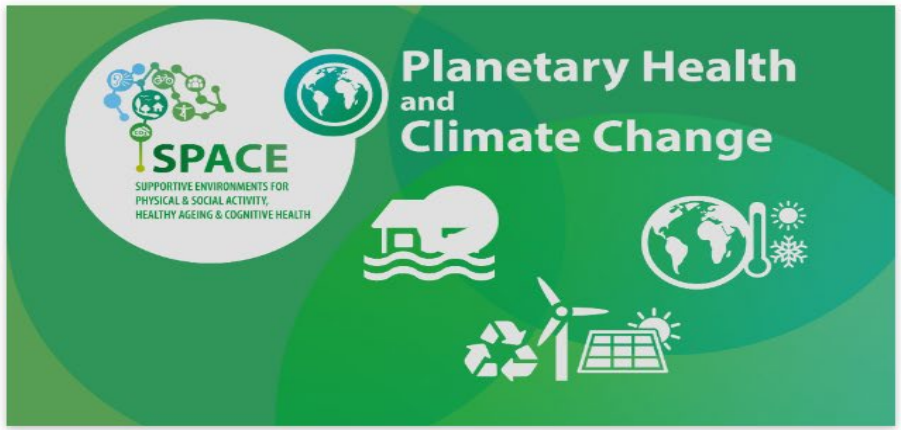
Green and Blue Space

Green and Blue Space Factsheet

Urban Planning

Urban Planning Factsheet

Air and Soil Pollution



Planetary Health and Climate Change

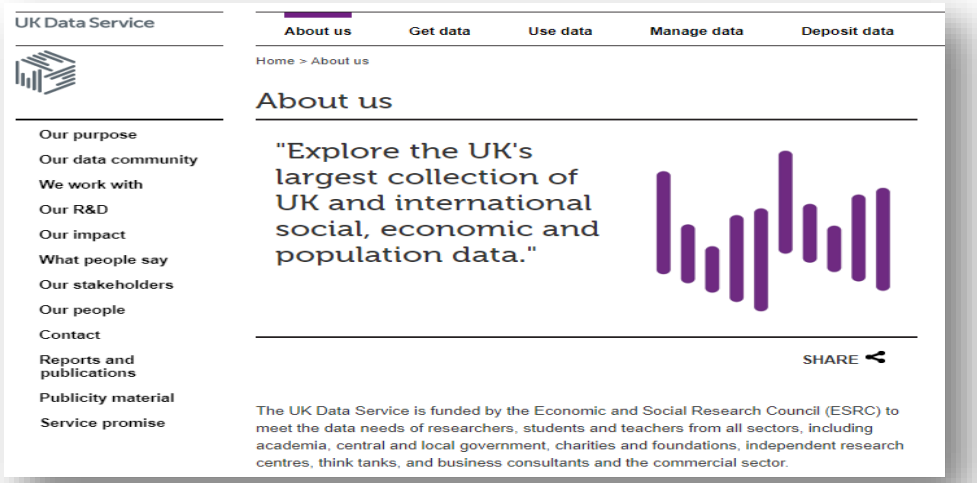
Link to videos and fact sheets: https://www.qub.ac.uk/sites/space/VideosandFactsheets/

Publications from NICOLA

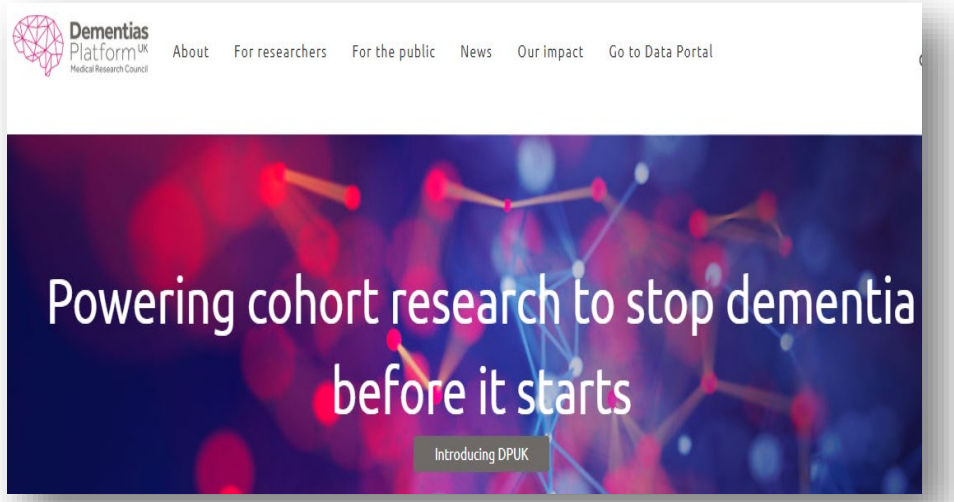
- **Scientific evidence:** publication of over 100 papers in scientific journals
- **Reports:** Wave 1 report, Health assessment report
- **Evidence for policy makers and stakeholders** e.g. Belfast Healthy Cities, Local Councils, AgeNI, Department of Health
- **Newsletters:** feedback of study findings to participants

NICOLA DATA REPOSITORIES

1. UK Data Service (www.ukdataservice.ac.uk)

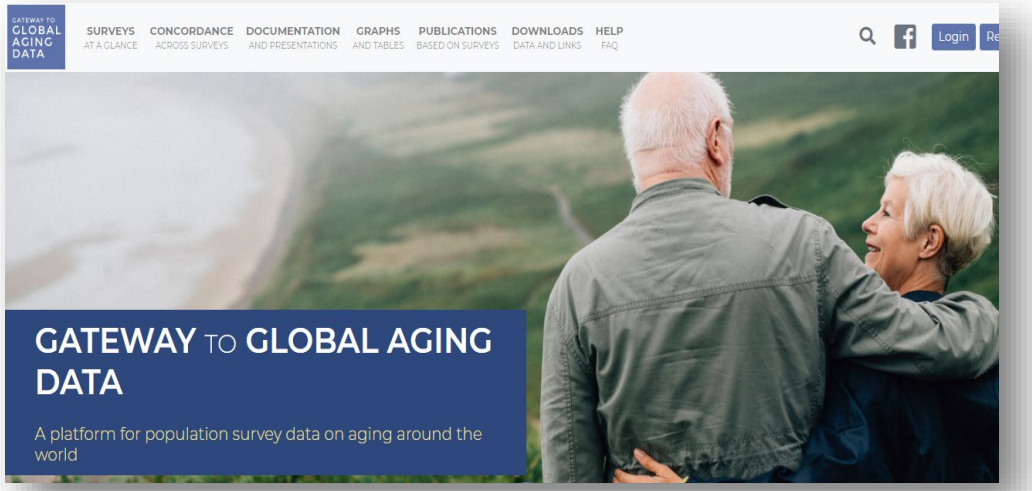


2. Dementias Platform UK (www.dementiasplatform.uk)



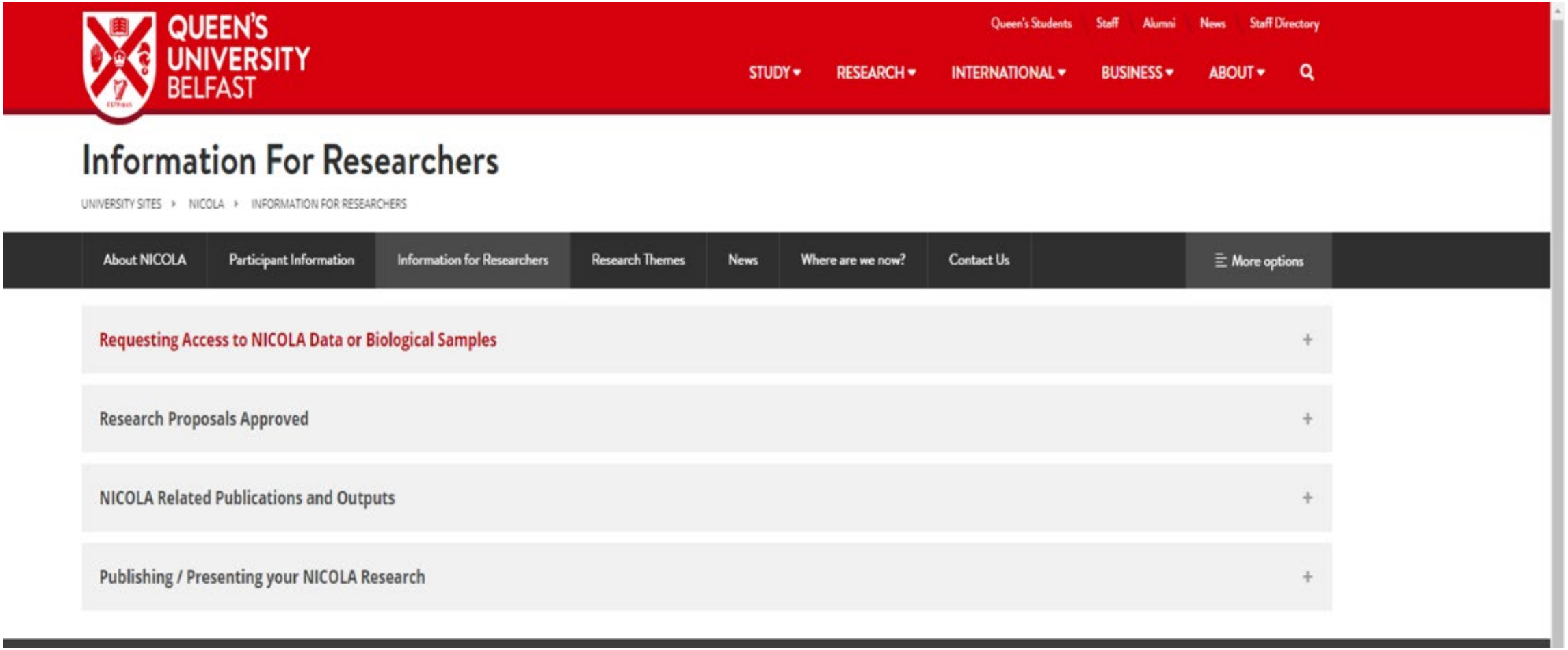
3. UK Longitudinal Linkage Collaboration (UK LLC) (https://ukllc.ac.uk/)

4. Gateway to Global Aging (www.g2aging.org)



NICOLA Website

https://www.qub.ac.uk/sites/NICOLA/Informationforresearchers/



NICOLA – What next ??

Proposed plan for Wave 3

Objectives:

- To carry out a home-based health assessment and interview on current cohort maintaining some core content and compatibility with Waves 1 and 2.
- Inclusion of new data and measures: COVID related data, COVID antibodies, microbiome analysis, food insecurity, fuel poverty
- To administer a repeat HCAP to a subsample of 1000 participants
- To archive data and metadata with data repositories e.g. UK LLC, UK Data Service, DPUK, Catalogue of Mental Health Measures, Gateway to Global Ageing
- Extend data linkage to include routine HSC data and data from the NI Cancer Registry
- Maintain data management support to facilitate access to the NICOLA resource
- Provide national/internationally comparable data and metadata to improve policy and services for older adults
- Generate new insights into pathways underlying and trajectories of healthy ageing
- Provide enhanced infrastructure for future policy relevant research on ageing

Wave 3: Proposed Study Design

- Participants: invite to be sent to current cohort of NICOLA participants (Wave 2 including cohort refresh)
- Home based CAPI interview and health assessment (approx. 70-90 mins)
- Core repeat topics for inclusion:
  - Social circumstances
  - Cognitive health
  - Mental health
  - Eye health
  - Health services utilisation

New topics for inclusion:
COVID follow-up questions
Fuel poverty
Food insecurity tool
Financial wellbeing/insecurity
Digital technology
Microbiome
Covid-19 antibodies
Environment
Other topics e.g. views on ageing, ageism etc

Acknowledgements / Funders

NICOLA Core Team

Prof Frank Kee - Scientific Director
Prof Dermot O'Reilly - Operations Director
Prof Bernadette McGuinness - Clinical Lead
Mrs Amanda Coulter - Project Manager
Dr Charlotte Neville - Scientific Officer
Angela Scott - Data Manager
Prof Amy Jayne McKnight - Biorepository

Research Leads

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Prof Michael Donnelly – Health services
Dr Ruth Hogg - Ophthalmology
Prof Bernadette McGuinness-Cognition
Dr Paula Devine – Sociology
Prof AJ McKnight – Multiomics, CKD
Prof Ruth Hunter – Environment
Prof Mark Tully – Physical activity
Dr Noleen McCorry – Mental health
Prof Jose Bengoechea – Microbiome
Dr Chris Watson - Cardiovascular

Website: https://www.qub.ac.uk/sites/NICOLA/Informationforresearchers/

The Atlantic Philanthropies
UK Clinical Research Collaboration igniting our potential
CARDI Centre for Ageing Research and Development in Ireland
Office of the First Minister and Deputy First Minister
E·S·R·C Economic & Social Research Council
HSC Public Health Agency Research and Development
wellcome
The Wolfson Foundation
Queen's University Belfast

QUEEN'S UNIVERSITY BELFAST

NICOLA

Understanding Today for a Healthier Tomorrow

Thank You

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