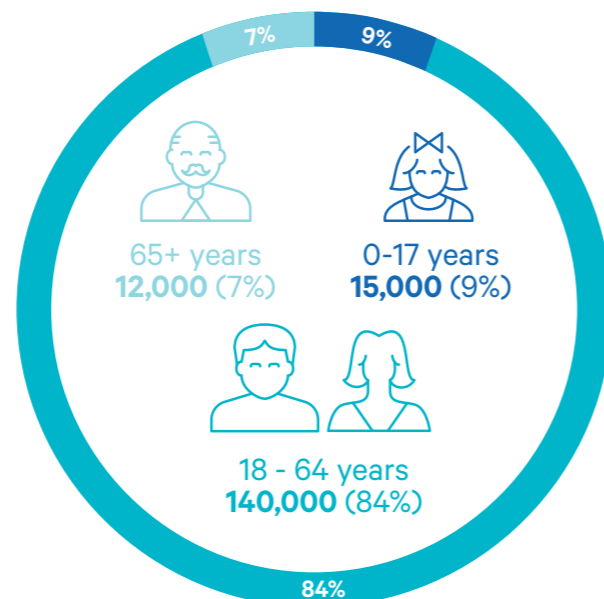# lifelines
cohort and biobank

Lifelines is a large, multi-generational cohort study that includes over 167,000 participants from the northern population of the Netherlands. Lifelines works with a combination of questionnaires, measurements and biological samples; thus, providing a unique source for research purposes. Participants from three generations are followed for at least 30 years, to obtain insight into healthy ageing and the main factors relating to the onset and progression of diseases. Every 1.5 years, participants complete a questionnaire, in which they provide a wide variety of data. In addition, once every 5 years, participants are invited to visit a Lifelines location for a physical examination. During this visit, biological samples are collected and several measurements and tests are conducted. Biological samples are stored at -80˚C to ensure high quality and long-term preservation.

7%   9%

65+ years
12,000 (7%)

0-17 years
15,000 (9%)

18 - 64 years
140,000 (84%)

84%

total: 167,000 participants

genetics

participants with genetic data (GWAS)
13,000

sibling sets (brothers/sisters in cohort)
7,000

participants part of 3-generations in cohort
20,000

participants part of 2-generations in cohort
84,000

participants with children
45,000

biological samples

plasma samples (blood) stored at -80 ℃
3,000,000

serum samples (blood) stored at -80 ℃
1,000,000

24h urine samples stored at -80 ℃
2,000,000

hair samples
54,000

lifelines
adults

October 2017

lifelines
adults

There are many unmet needs to diagnose, prevent and treat disease. Therefore, it is important to understand why some people stay healthy in old age, while others are affected by disease. Many risk factors for disease have their origin in early life. This is why we collect a large selection of data and biological samples from adults as well as from children. This overview provides information about the data that we collected from adults , age 18 and up, between 2006 and 2017.
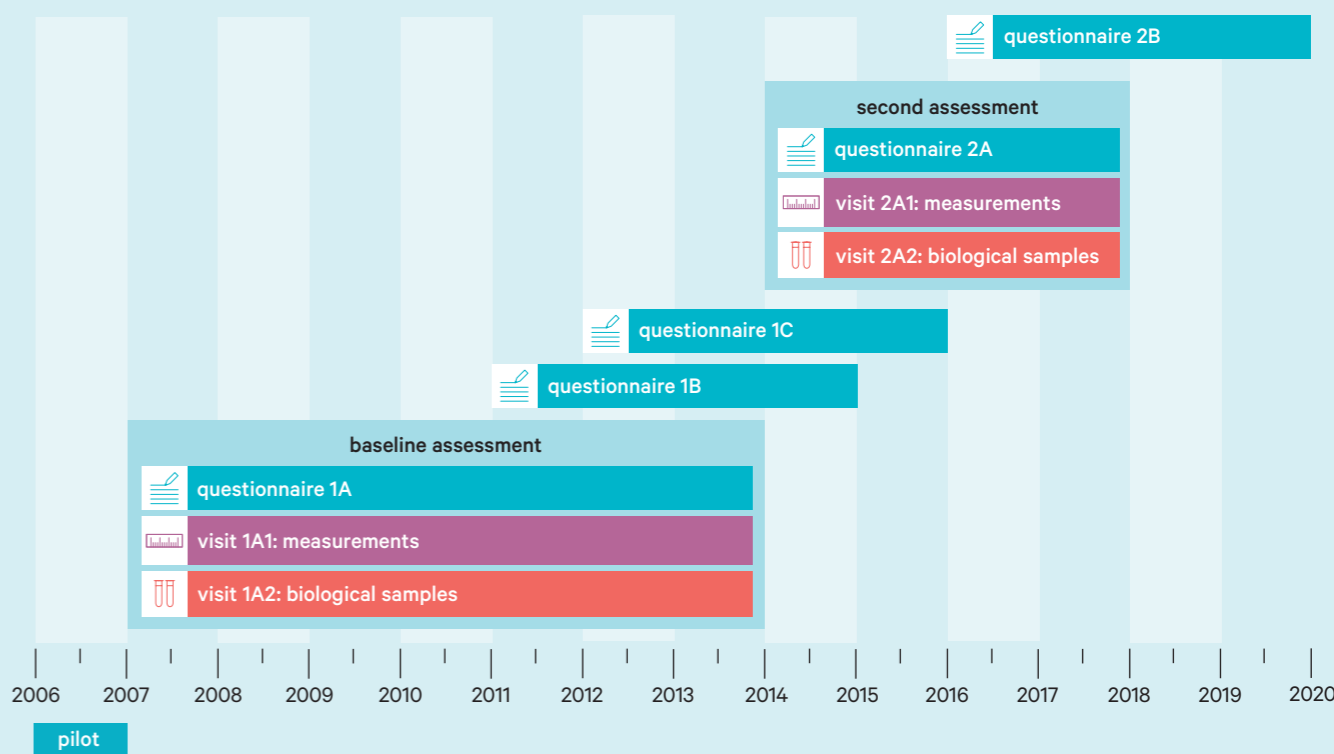
questionnaire 2B

second assessment
questionnaire 2A
visit 2A1: measurements
visit 2A2: biological samples

questionnaire 1C

questionnaire 1B

baseline assessment
questionnaire 1A
visit 1A1: measurements
visit 1A2: biological samples

2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

pilot

baseline assessment 1A

questionnaires

- activities (physical activity, TV watching, informal care)
- birth
- body weight
- demographics (education, living situation)
- family composition
- family health history
- health status
- health perception
- medication use
- surgery
- independency (65+)
- health care
- mental health (stress)
- nutrition
- personality
- living environment
- quality of life
- questions for females (menstruation, pregnancy)
- sleeping
- smoking
- social support
- wellbeing
- work

interviews

- MMSE (65+)
- MINI

measurements

- skin autofluorescence
- anthropometry
- blood pressure
- ECG
- lung function
- RFFT

laboratory assessment: urine

- albumin
- creatinine

biological samples

- blood (fasting sample)
- 24h urine
- spot urine (morning)
- DNA

laboratory assessment: blood

- ALAT
- ASAT
- albumin
- alkaline phosphatase
- anti-CCP
- anti-dsDNA
- apolipo A1
- apolipo B100
- basophilic granulocytes
- CTD screen
- calcium
- cholesterol
- creatinine
- eosinophil granulocytes
- erythrocytes
- free T3
- free T4
- gamma-GT
- glucose
- HDL cholesterol
- HbA1c
- hematocrit
- hemoglobin
- high-sensitivity CRP
- LDL cholesterol
- leukocytes
- lymphocytes
- monocytes
- mononuclear cells
- neutrophil granulocytes
- phosphate
- potassium
- SSA preg
- sodium
- TSH
- thrombocytes
- triglycerides
- ureum
- uric acid

follow-up questionnaire 1B

questionnaires

- activities (physical activity, mobile phone use)
- birth
- body weight
- demographics (ethnicity, living situation)
- family composition
- family health history
- health status
- health perception
- medication use
- surgery
- independency (65+)
- health care
- living environment
- mental health (stress)
- nutrition and diet
- personality
- quality of life
- sleeping
- smoking
- somatisation
- social support
- work

follow-up questionnaire 1C

questionnaires

- activities (physical activity, informal care)
- body weight
- demographics (living situation)
- family composition
- family health history
- health status
- health perception
- medication use
- surgery
- health care
- mental health (stress)
- noise
- nutrition and diet
- personality
- living environment
- quality of life
- sleeping
- smoking
- somatisation
- social support
- work

second assessment 2A

questionnaires

- abdominal discomfort
- activities (physical activity, informal care)
- alcohol and drug use
- body weight
- demographics (education, living situation)
- vision
- family composition
- family health history
- fatigue
- food allergies
- health status
- health care
- medication use
- mental health (stress)
- nutrition and diet
- pain
- scalp hair
- smoking
- social support
- somatisation
- surgery
- quality of life
- work

interviews

- MINI (digital)

measurements

- anthropometry
- blood pressure
- Cogstate cognitive tests
- ECG
- jump test
- lung function

laboratory assessment: urine

- creatinine

biological samples

- blood (fasting sample)
- 24h urine
- faeces
- scalp hair

laboratory assessment: blood

- high-sensitivity CRP
- monocytes
- mononuclear Cells
- thrombocytes
- leukocytes
- lymphocytes
- erythrocytes
- neutrophil Granulocytes
- basophilic Granulocytes
- eosinophil Granulocytes
- cholesterol
- HDL Cholesterol
- LDL cholesterol
- creatinine
- glucose
- HbA1c
- hematocrit
- hemoglobin
- potassium
- sodium
- triglycerides

follow-up questionnaire 2B

questionnaires

- activities (informal care, physical activity, sedentary behaviour, internet use)
- alcohol and drug use
- bodyweight
- childhood traumas
- demographics (education, marital status)
- earthquakes
- family
- food behaviour
- biological food
- health perception
- hearing
- medication compliance
- over the counter medication
- perceived living environment
- smoking
- social support
- wellbeing
- work
- work functioning

biological samples in storage

blood
serum (septum separated tube, tube with clot activator), plasma (K2-EDTA tube, citrate tube), buffycoat (K2-EDTA tube), -80°C storage

urine
24 hour (native, mixed with ascorbic acid) early morning/fasting (native, mixed with ascorbic acid) -80°C storage

DNA
-80°C and 4°C storage

faeces
-80°C storage

scalp hair
room temperature