

BBMRI.nl

Biobanking and
BioMolecular resources
Research Infrastructure
The Netherlands

BBMRI.NL – A story of Sharing

Eline Slagboom

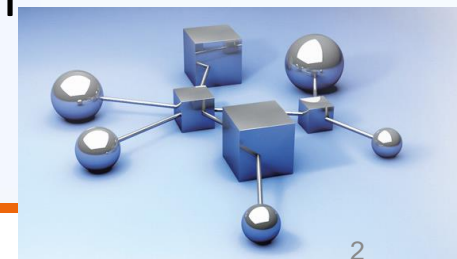
Molecular Epidemiology , Leiden University Medical Center

Brussel 20 Juni 2017

BBMRI-NL

TOWARDS A NATIONAL BIOBANKING INFRASTRUCTURE

- Founded in 2009 as the Dutch node within the European BBMRI-ERIC
- Established to align, connect, complete and enrich biobanks
- Connecting > 200 Dutch biobanks
- Innovative integration of complementary efforts involving data, tissue, samples, population imaging and IT for translational research
- Aims to establish a sustainable nation-wide infrastructure for collecting, managing and providing access to data and samples for cutting-edge translational biomedical research



Catalogue with
 > 200 biobanks

ELSI center of
 expertise

HOME | **BBMRI-NL CATALOGUE** | BIOBANK SERVICES - | ELSI SERVICES - | HEALTH-RI | PUBLICATIONS - | ABOUT BBMRI-NL - | CONTACT

WELCOME TO THE BBMRI-NL WEBSITE

For over six years, BBMRI-NL has been a promoting collaboration and biobanks in the Netherlands. body of biobanks in this country pathology collections, large p LifeLines, ERGO, NTR, a collections (Parelsnoer Institute, HEBON, KOALA, to name but a few).

Now, we have set our aims at uniting all relevant biomedical research infrastructures into one streamlined, efficient body of research infrastructure.

Towards a National Biobanking Infrastructure

Tools &
 Applications



SEARCH

Search ...

GO

RECENT NEWS

Vidi grant for Morris Swertz

FAQs on the General Data Protection Regulation for biobanking

BBMRI-NL at Open Science Conference 4-5 april

One national research infrastructure for prevention, personalized treatment, and health

De maatschappelijke adviesraad zoekt deelnemers

Highlights BBMRI-NL – molecular data

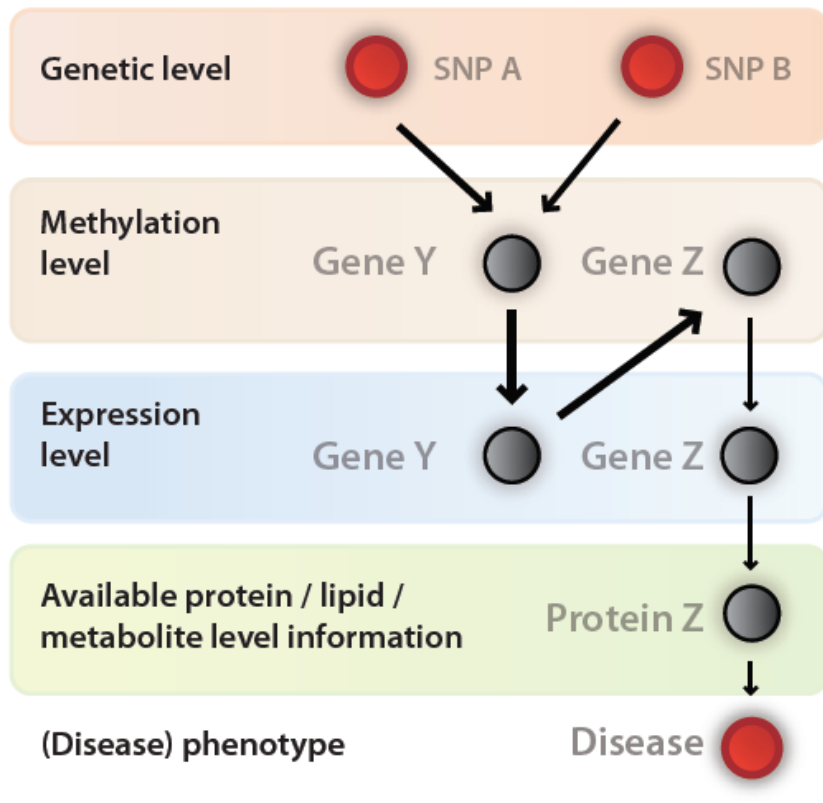
N=100,000 GWAS
N=750 Go.NIL

N=4,000

N=4,000

N=50,000

N>250,000



Go.NL
GENOMEoftheNETHERLANDS

BIOS
consortium

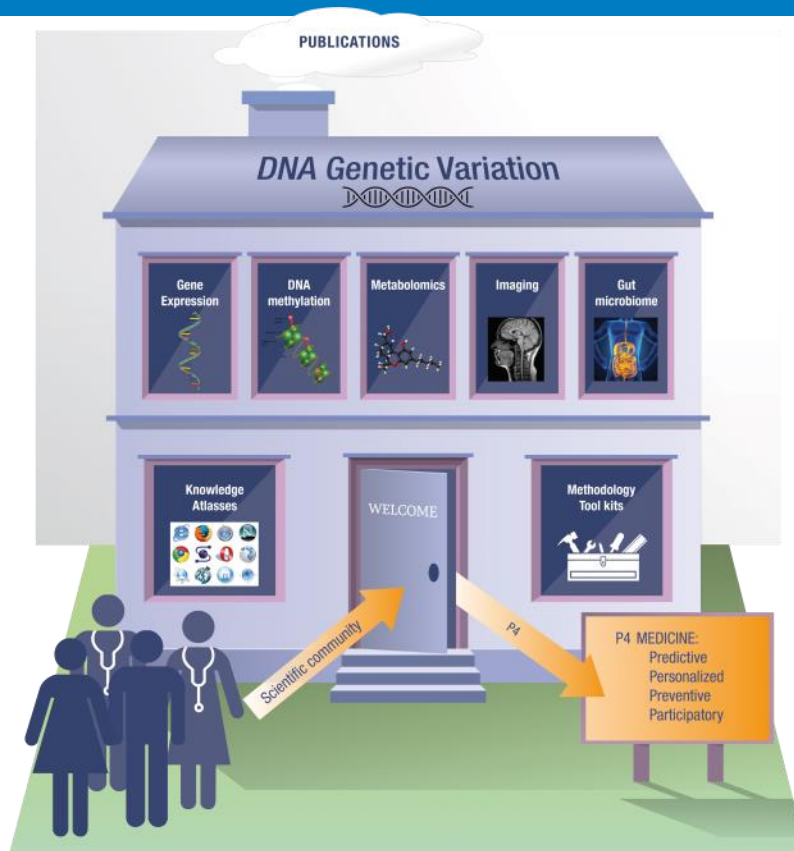
BIOS
consortium

METABOLITE
consortium

Building a central database for the research community

- To store raw and processed data
- Reference data for case-control studies and imputation
- Linking to clinical phenotypes

Warehouse of data shared and used by the community



26 PAPER S PUBLISHED; 8 IN PREP
 SCIENCE, NAT GENET(6);
 NAT COMM (3); GENOME BIOL (3)



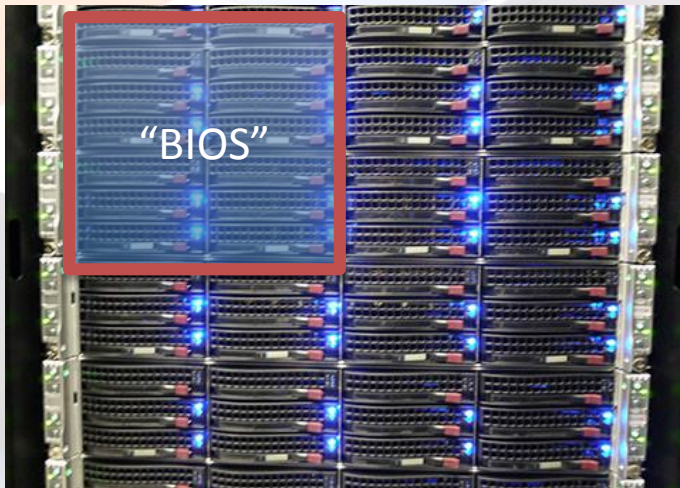
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Highlights BBMRI-NL – ‘Cloud’ for controlled access multi-center studies

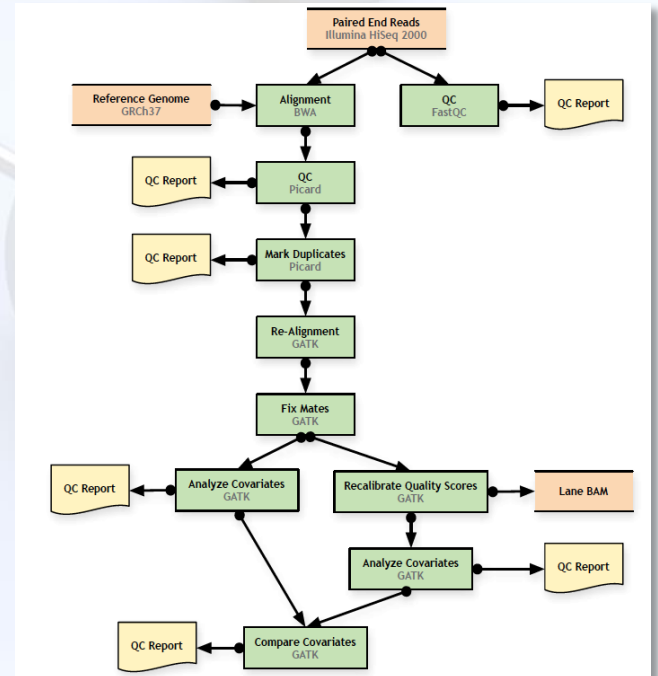
Storage & compute infrastructure services

(e.g. ‘virtual private cluster’ facilities at Groningen & Amsterdam)



Pipeline services

(e.g. imaging, DNA, RNA, metabolomics, microbiome)



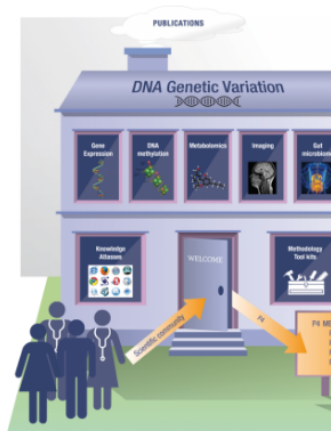
Integration and warehouse services

(e.g. clinical phenotypes, imaging phenotypes, molecular phenotypes, biobankconnect data harmonization, translational research toolbox)

BBMRI-OMICS

BBMRI-Omics is the joint collection of omics data made available for BBMRI researchers for research purposes.

BBMRI-Omics Warehouse with available data types:



Health (formerly Brainsshake) technology.

In the future, BBMRI-Omics intend to extend the data to include microbiome data.

enis-biobank-plots-app v0.0.1 BETA see below for more info



Filters

Reset

Data type

- Transcriptome (RNAseq)
- Methylome (Illumina)
- Genotypes (Imputed)
- Metabolome (Brains)
- Whole Genome Sequencing (Illumina HiSeq)
- Whole bloodcell count

Sex

- Male
- Female

Smoking data available

- Yes
- No

Age

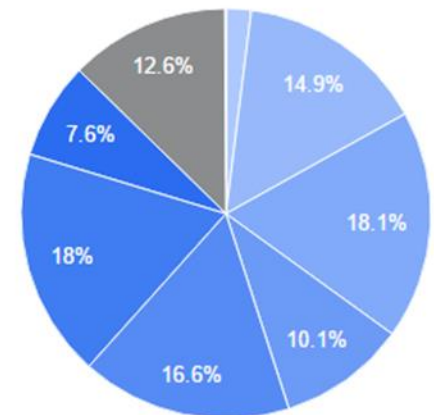
- <20
- 20-30
- 30-40
- 40-50
- 50-60
- 60-70
- 70-80
- Unknown
- Other (all groups < 0.1%)

Number of Samples per Biobank

Total number of samples: 26227

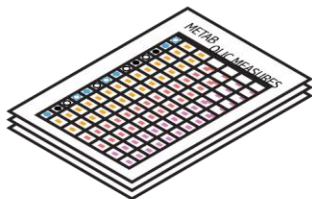
Age distribution

- <20
- 20-30
- 30-40
- 40-50
- 50-60
- 60-70
- 70-80
- Unknown
- Other (all groups < 0.1%)



1H-NMR metabolomics platform

Metabolic health ; well-standardized (50.000 samples ; 30 cohorts)



Fluid balance

- Creatinine (mmol/l)
- Albumin (signal area)

Inflammation (mmol/l)

- Glycoprotein acetyls, mainly α 1-acid glycoprotein

Fatty acids and saturation

- Total fatty acids
- Estimated degree of unsaturation

Fatty acids (mmol/l and % of total FAs)

- \circ Omega-3 fatty acids
- \circ Omega-6 fatty acids
- Polyunsaturated fatty acids
- Monounsaturated fatty acids; 16:1, 18:1
- Saturated fatty acids
- Docosahexaenoic acid; 22:6
- Linoleic acid; 18:2



Ketone bodies (mmol/l)

- Acetate
- Acetoacetate
- 3-hydroxybutyrate

Glycolysis related metabolites (mmol/l)

- Glucose
- Lactate
- Pyruvate
- Citrate
- Glycerol*

(* not available for EDTA plasma samples)

Cholesterol (mmol/l)

- VLDL cholesterol
- LDL cholesterol
- HDL cholesterol
- HDL₂ cholesterol
- HDL₃ cholesterol
- Cholesterol
- Free cholesterol
- Esterified cholesterol
- Remnant cholesterol

Apolipoproteins (g/l)

- ApoA-I
- ApoB
- ApoB/ApoA-I

Amino acids (mmol/l)

- Alanine
- Glutamine
- Glycine*
- Histidine

Branched-chain amino acids

- Isoleucine
- Leucine
- Valine

Aromatic amino acids

- Phenylalanine
- Tyrosine

Glycerides & phospholipids (mmol/l)

- VLDL triglycerides
- LDL triglycerides
- HDL triglycerides
- Triglycerides
- Phosphoglycerides
- Ratio of triglycerides to phosphoglycerides
- Phosphatidylcholine and other cholines
- Sphingomyelins
- Total cholines

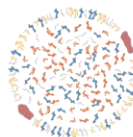
Lipoprotein particle size (nm)

- Mean diameter of VLDL particles
- Mean diameter of LDL particles
- Mean diameter of HDL particles

14 LIPOPROTEIN SUBCLASSES

12 lipid measures for each subclass

- Esterified cholesterol (mmol/l and % of total lipids)
- Free cholesterol (mmol/l and % of total lipids)
- Triglycerides (mmol/l and % of total lipids)
- Phospholipids (mmol/l and % of total lipids)
- Total cholesterol (mmol/l and % of total lipids)
- Total lipids (mmol/l)
- Particle concentration (μ mol/l)



Average particle size (diameter in nm)

>75 64 53.6 44.5 36.8 31.3 28.6 25.5 23.0 18.7 14.3 12.1 10.9 8.7

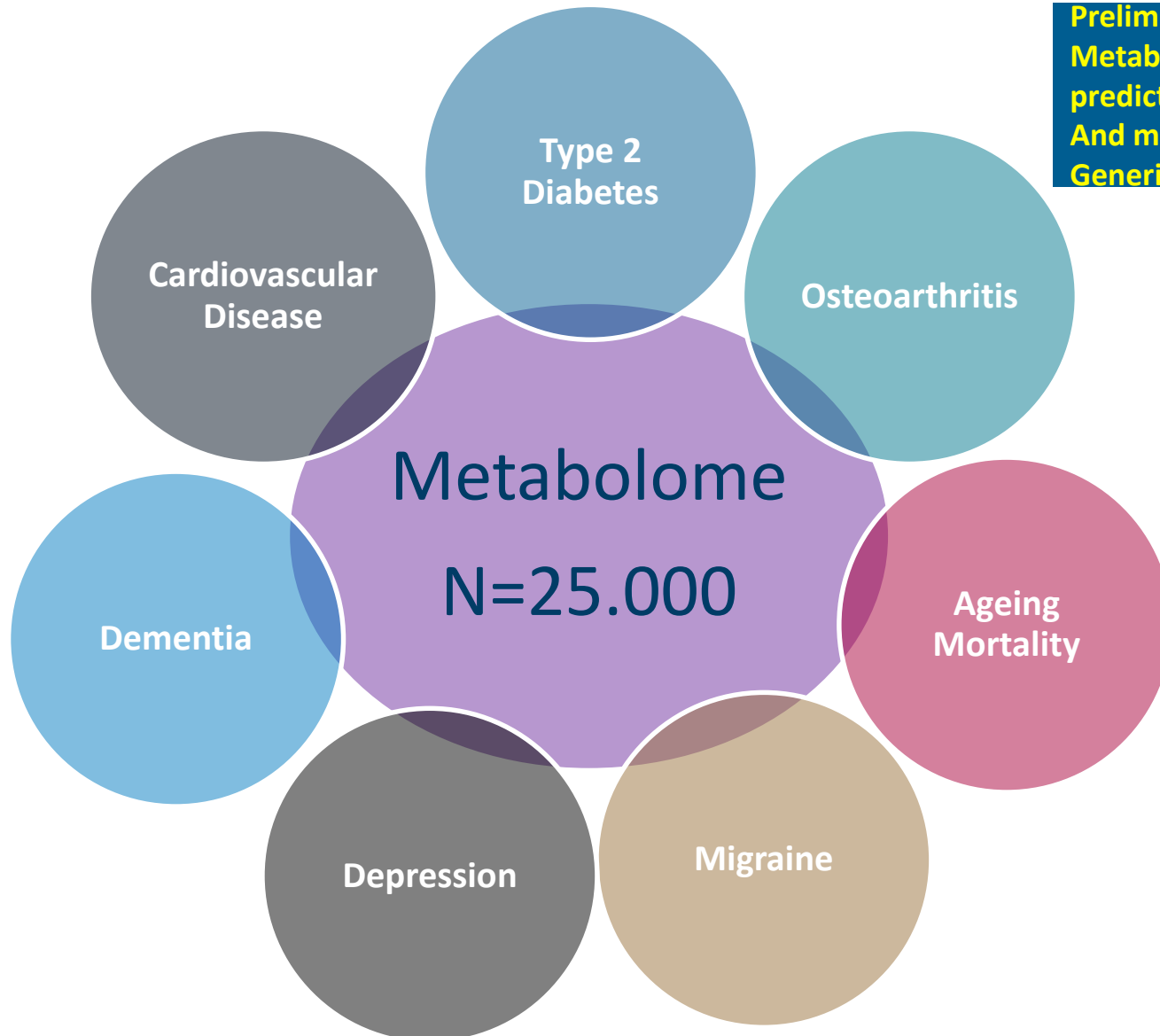
6 VLDL subclasses IDL 3 LDL subclasses 4 HDL subclasses

Average lipid composition (%)

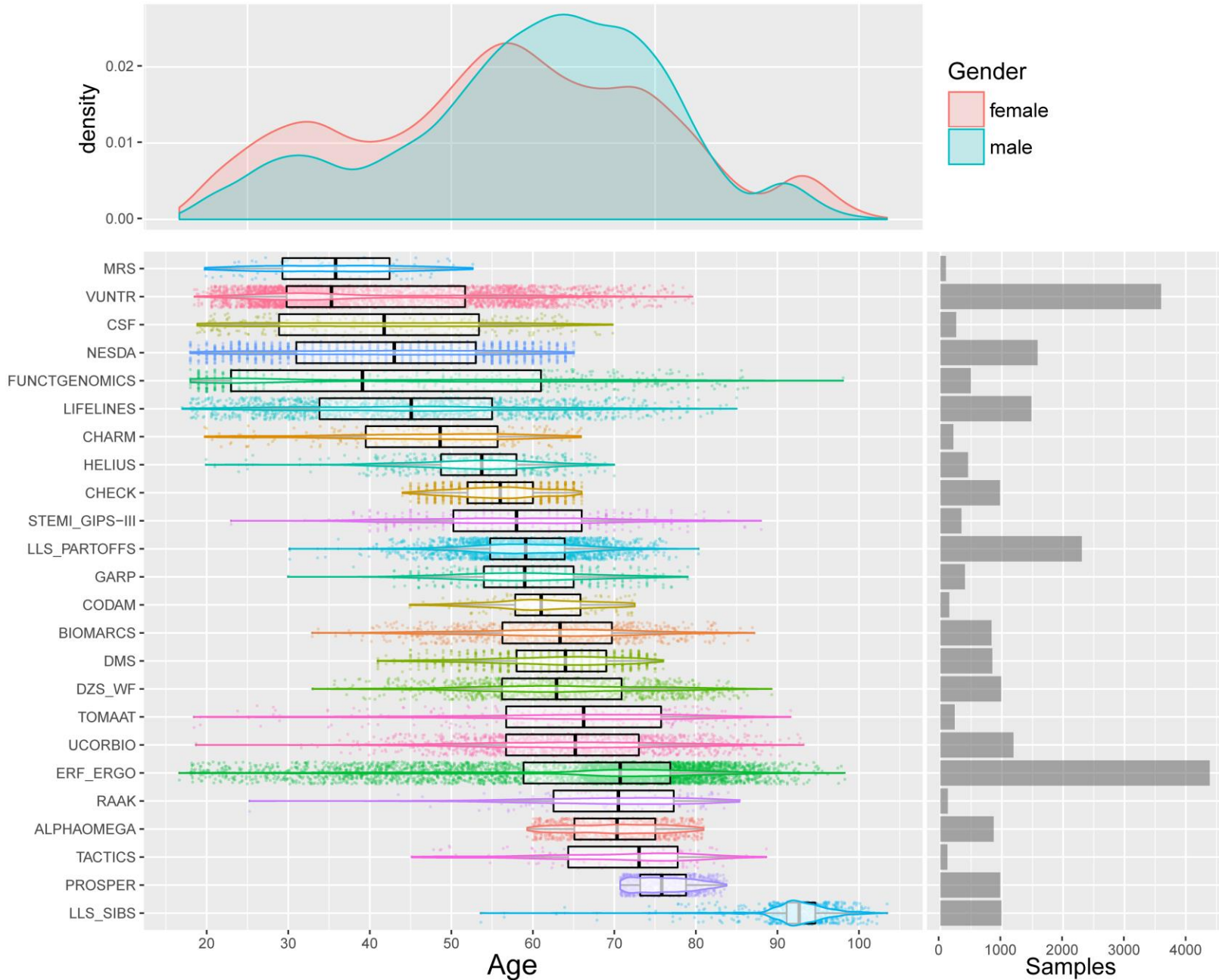


BBMRI.NI : 7 Diseases; 22 cohorts; 25.000 Dutch Caucasians Overlapping (Generic) risk profiles

**Preliminary results:
Metabolomics markers
predict multiple diseases
And mortality
Generic profiles of health**

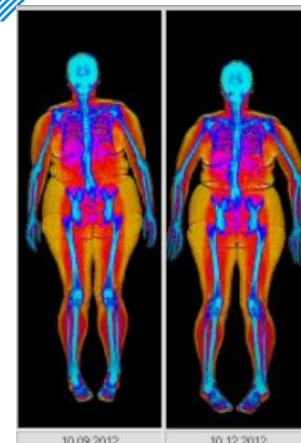
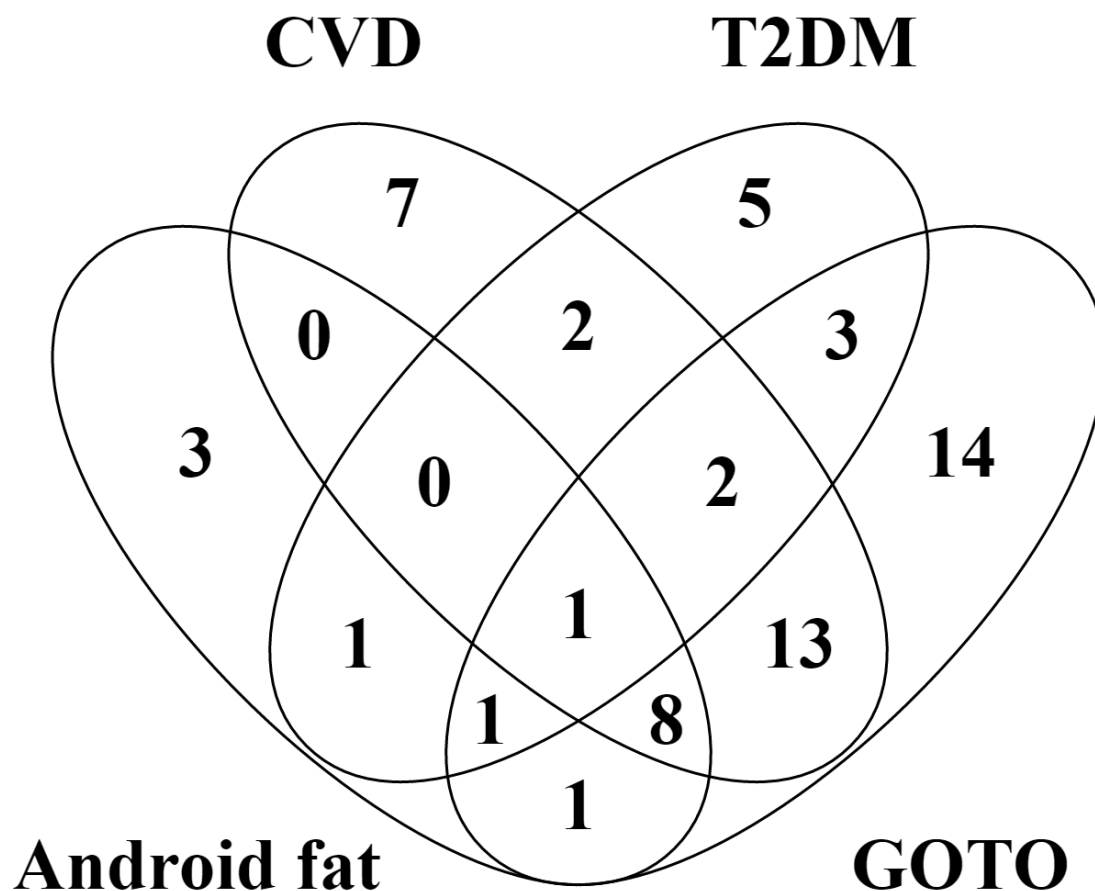


Metabolic Health or age scores ; compare to traditional markers; multiple sampling



Risk assessment; Monitoring; Understanding

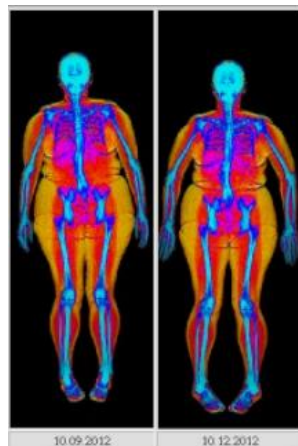
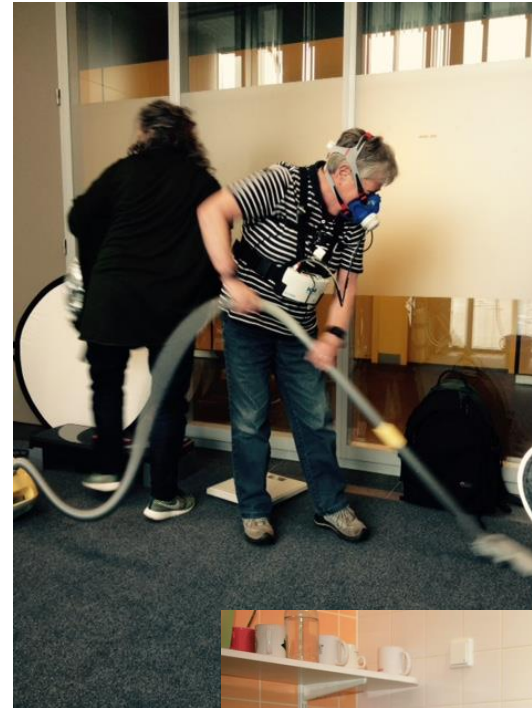
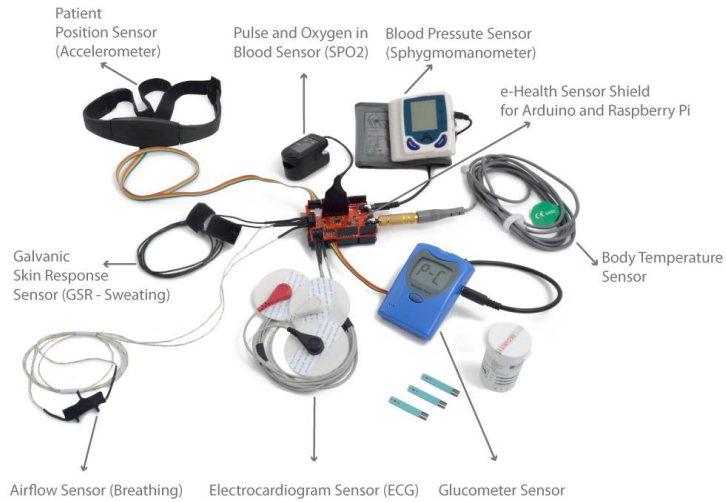
What does the Metabolome reflect:



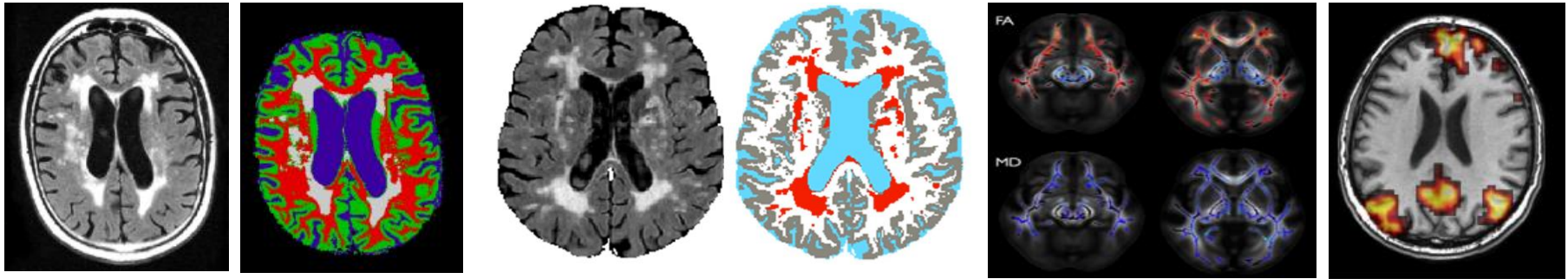
Preliminary results:
 Metabolomics markers in blood associate to CVD/T2D,
 response to intervention and android fat in DEXA

Combining with e-health , monitoring the vital lifecourse

Public domain -> primary & secondary care → at home/home care



Highlights BBMRI-NL – imaging data



Building a population imaging infrastructure

- Pool existing image data and generate new data
- Central database to store raw and processed data
- Procedures to harmonize data
- Development of reference data for case-control studies, spanning wide age range
- Linking image data to clinical and molecular phenotypes

Neuro-cardiovascular

Musculoskeletal

CLASSIFICATION
BIOMARKERS
SPECIFIC AND GENERIC
NON-INVASIVE (SERUM, MRI)

Immune
/Metabolic
Health
Biological
age

UNDERSTANDING
METABOLIC HEALTH
HETEROGENEITY
BEYOND BLOOD

INTERVENTIONS
MONITORING
LIFESTYLE/CLINIC
HETEROGENEOUS RESPONSES

Highlights BBMRI-NL – access to archival tumor material

Dutch National Tissuebank Portal

12 million tissue samples stored in
pathology archives
42 million records on almost 10 million
patients stored in the central data- bank

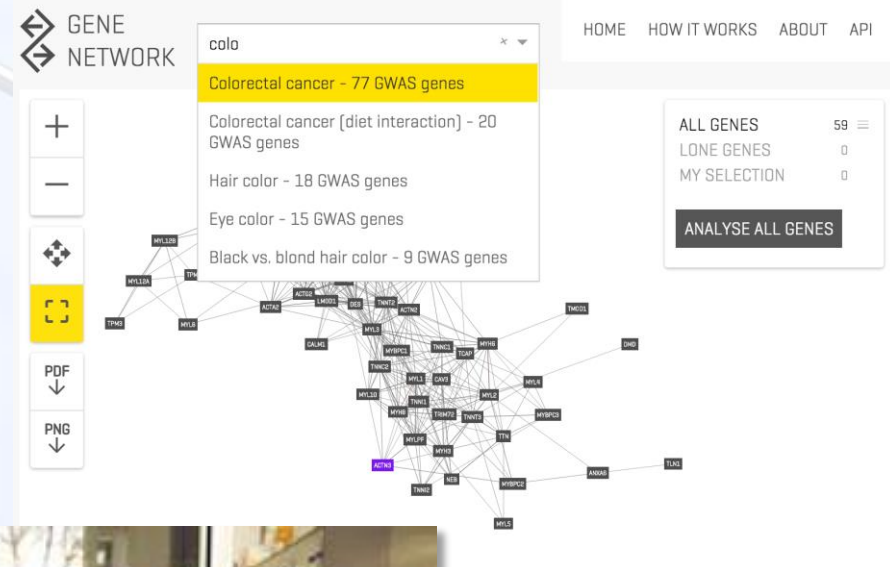


Highlights BBMRI-NL – public access to BBMRI generated knowledge via ‘APPS’

Apps for the clinic



Apps for researchers



Apps for the public





Thank you on behalf of the BBMRI-NL partners