

*Gemeinsam forschen für eine gesündere Zukunft*



**German National Cohort (GNC)**

# **Which data does the GNC (=NAKO) provide?**

**Wolfgang Ahrens**

Leibniz-Institute for Prevention Research and Epidemiology – BIPS  
& University Bremen

3. BPI-Workshop

**„Evidenzgenerierung außerhalb von RCTs“**

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Beuth Hochschule für Technik, Haus A, Beuth Halle, Lütticher Str. 38, 13353 Berlin

**Gefördert vom Bund,  
den Ländern und der  
Helmholtz-Gemeinschaft**



# German National Cohort

- Recruitment of 200,000 men and women aged 20 to 69 years
- 18 study centers
- Standard examination protocol: N=200,000 (Level 1)
- In-depth examination protocol: N=40,000 (Level 2)
- Magnet resonance imaging: N=30,000, 5 study centers
- Optional satellite studies with additional funding (Level 3)

**Level 1:**  
Standard examination  
(N=200,00)

**Level 2:**  
Extended examination  
(N=40,000)

**MRI:**  
Whole body,  
heart, brain  
(N=30,000)

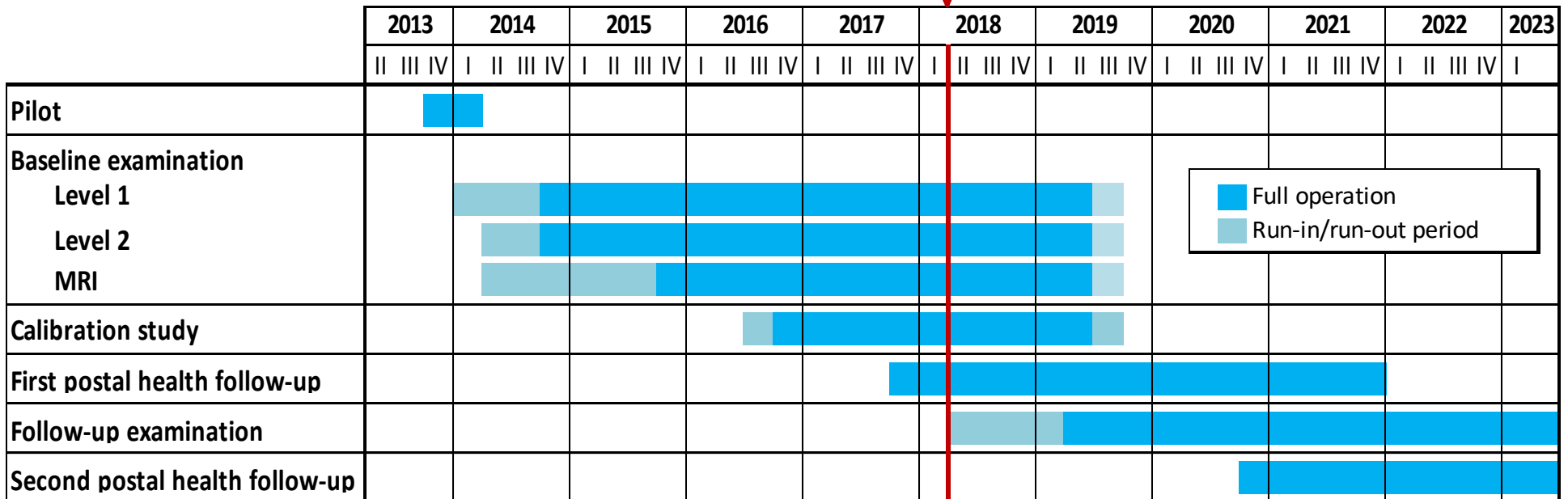
# General Objectives

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1. Identification of **etiological pathways** from life-style and environmental risk factors to **major chronic diseases** and functional impairments
2. Causes of **geographic and socio-economic disparities** in health status and disease risks
3. Development of **risk prediction models** for identifying individuals at increased risk for major chronic diseases, in a framework of **personalized prevention** strategies in Germany
4. Evaluation of markers for **early detection of disease** and pre-disease phenotypes, in order to develop effective tools for disease prevention.

# Timeline Baseline and Follow-up

April 2018



# A Short History

**2008**

Study concept evaluated within  
Helmholtz association

**2009**

Epidem. Planning Committee  
Public hearing + call for interest  
Selection of study centres

**2010**

**2011**

Application 'German National Cohort'  
Evaluation by internat. reviewers  
Conduct of 'pretest 1'

**2012**

Conduct of 'pretest 2'  
Foundation of 'National Cohort e.V.'  
Application for funding to BMBF

**2013**

Granted funding for 5 y  
Set up of study centres

**2014**

Data protect. concept + ethical votes  
Conduct of pilot study  
Final review  
Start of main phase (Oct 1, 2014)

**2015**

Renaming: 'NAKO Health study'

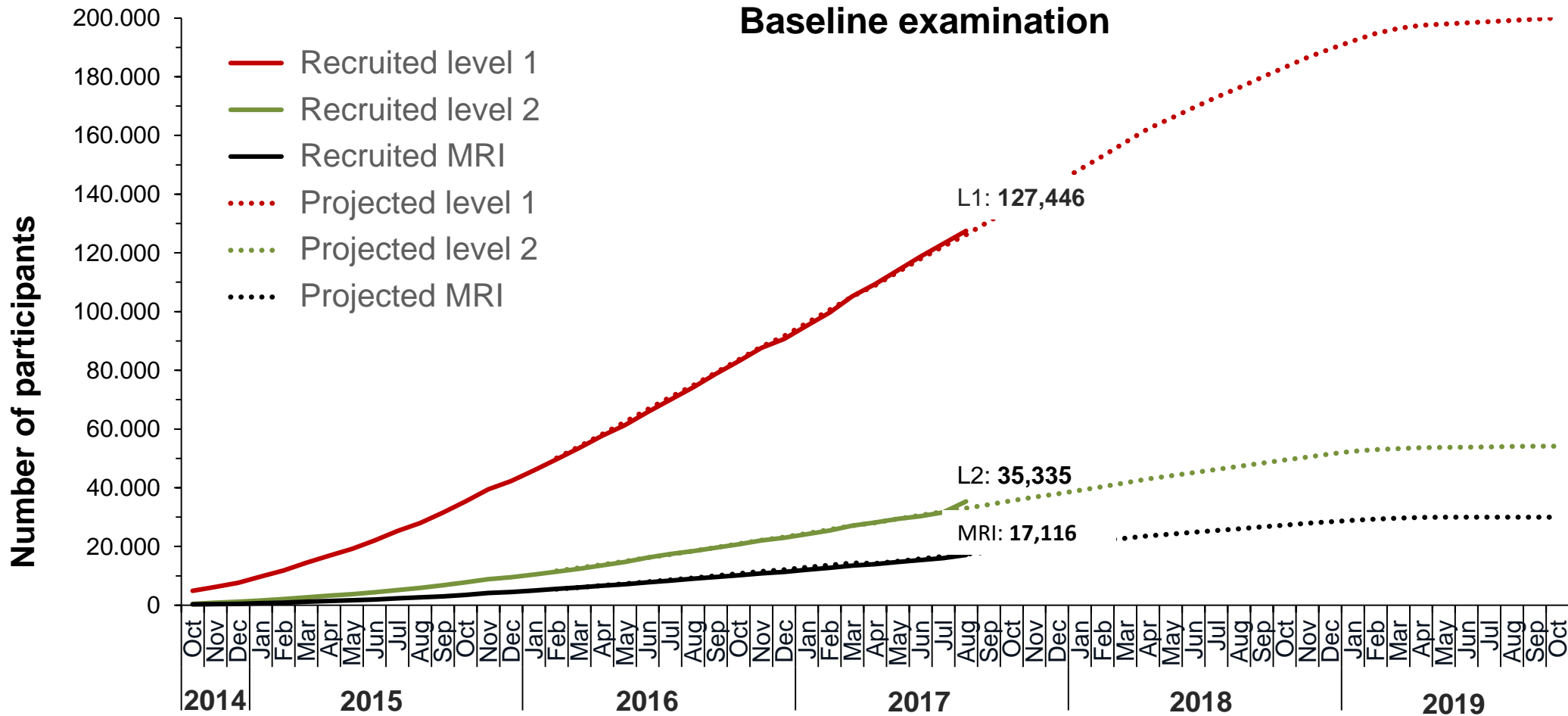
**2016**

Start of calibration study

**2017**

100,000 participants (May 31, 2017)

# Recruitment Status by August 2017



# Procedures at the Study Centers

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- Welcome and reception
- Study information and informed consent
- Face to face interview  
social factors, potential risk factors, exposures, medical history, reproductive history, medication
- Examinations and measurements
- Collection of biomaterials
- Touch screen based self-completion questionnaires
- Homework distribution  
(7-day actigraphy/ 24h Somnowatch, physical activity diary, food frequency questionnaire)
- Summary and fare-well

# Interview Modules

## Socioeconomic factors

Nationality, ethnicity, native language

Marital status, Housing situation

Education, occupation, income

Partner's education

Parents' education, occupation

## Women's questions

Menstrual cycle

Hormonal contraception

Menopause + Hormone replacement

Polycystic ovary syndrome + HPV

## Medical history

Cardiovascular diseases

Cancer

Metabolic diseases

Allergies

Musculoskeletal diseases

Eye diseases

Pulmonary diseases

Skin diseases

Gastrointestinal + liver diseases

Renal diseases

Neurological/Psychiatric diseases

Infections

Operations

## Medication use (past 7 days)



# Examination Modules

Disease group	Examination
<b>Cardiovascular system</b>	Blood pressure, heart rate
	10-s Electrocardiography <b>L2</b>
	3-D-Echocardiography <b>L2</b>
	Vascular Explorer (ABI, PWA)
	Long-term ECG (Somnowatch) <b>L2</b>
<b>Diabetes-related</b>	Oral glucose tolerance test
	AGE reader (skin autofluoresc.) <b>L2</b>
<b>Cognitive function</b>	Test batteries <b>L1+L2</b>
<b>Lung function</b>	Spirometry
	Nitric oxide (FeNO) <b>L2</b>
<b>Musculoskeletal system</b>	Medical examinations (hip, knee, hands) <b>1 of 3</b>

Disease group	Examination
<b>Oral health</b>	Tooth count
	Oral examination <b>1 of 3</b>
<b>Sensory systems</b>	Retinal photography, visus test <b>L2</b>
	Hearing test (50%) <b>L2</b>
	Olfactory test <b>L2</b>
<b>Physical activity/fitness</b>	7-day accelerometry (50%)
	Bicycle ergometry <b>1 of 3</b>
	Hand grip strength
<b>Anthropometry</b>	Body weight and height, BIA
	Waist circumference
	Ultrasound abdominal fat <b>L2</b>
<b>Bio samples:</b> Blood, urine, saliva, stool, nasal swap	

# Touch Screen Modules

## Medical anamnesis

Cardiovascular diseases	Mental health
Respiratory health	Headache
Infections	Oral health
Gastrointestinal sympt.	Restless legs <b>L2</b>
Family medical history	Pain mannequin <b>L2</b>
Accidents + fractures	Seeing + hearing <b>L2</b>

## Psychological factors

Health-related Quality of Life	Personality
Childhood, youth (traumata)	Stress + fatigue
Occupational reward + strain	Sleeping habits

## Behaviour. fact.

Smoking habits
Alcohol consumption
Physical Fitness
Physical Activity
Daily activities
Drug consumption
Nutrition

## Further factors

Occupational expos. <b>L2</b>
Environmental expos.
Animal exposures <b>L2</b>
Tattoos and solarium
Screening/Check-ups
Use of medical services
Weight history

## Social factors

Pregnancies (f) / family planning (m)
Social networks + support

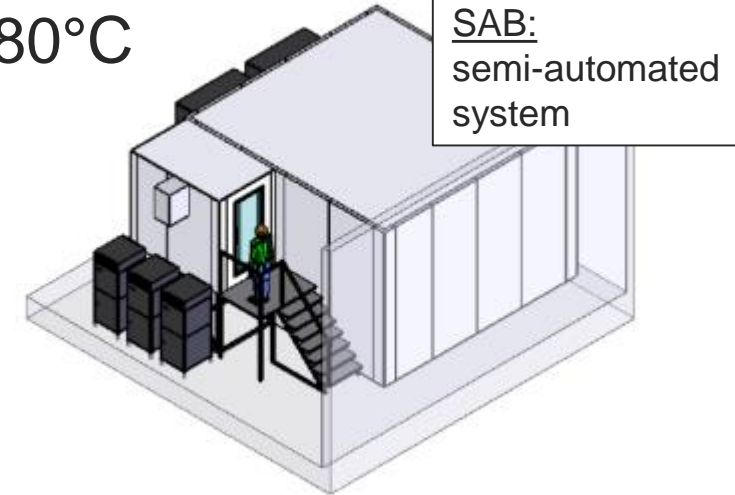
# Sample Size per Module (Aug 2017)

Module	N	Module	N
L1 7-day accelerometry (50%)	56,470	L2 ultrasound of abdom. fat	27,014
L1 anthropometry	125,166	L2 AGE reader	26,334
L1 blood pressure	126,567	L2 3D echocardiography	21,558
L1 hand grip strength	125,030	L2 nitric oxide in exhaled air	27,002
L1 cognitive function	121,826	L2 olfactory test	32,073
L1 spirometry	117,895	L2 visus test	30,160
L1 vascular explorer	120,387	L2 electrocardiography	29,042
L1 tooth count	113,816	L2 SOMNOwatch	10,779
MRI	16,695	L1 1 of 3	8,000 to 12,0000

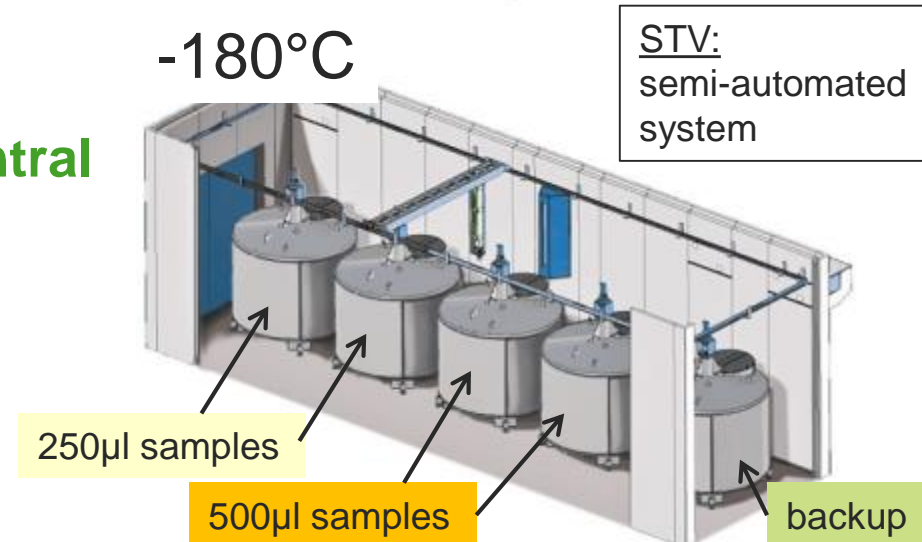
# Biorepository of the GNC

- Central infrastructural element of the **GNC**
- Provision of top-quality bio-samples over a very long time period (30 years)
- Samples from 200.000 participants
- 27,1 Mio. samples will be collected in 18 study centers all over Germany during the recruitment and re-assessment phase
- 20,7 Mio. samples will be stored in the **Central Biorepository** at the HMGU in Munich for state-of-the-art and risk minimized storage
- 6,4 Mio. samples remain for local storage

-80°C



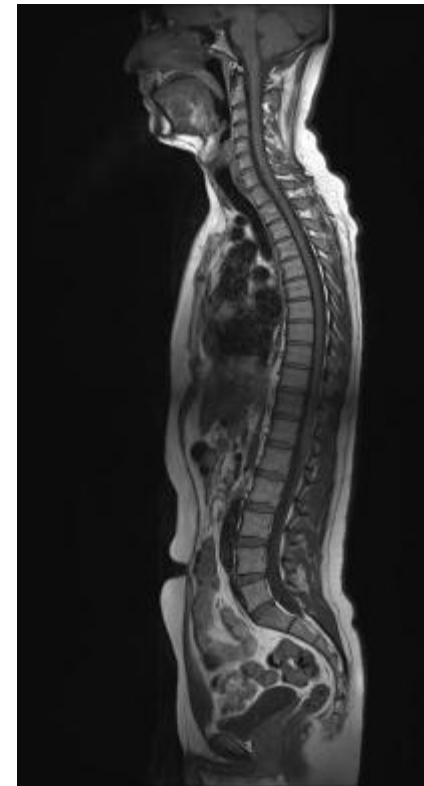
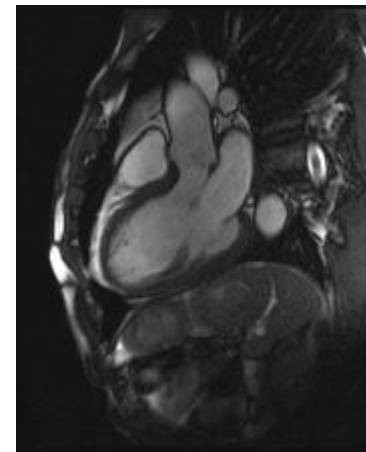
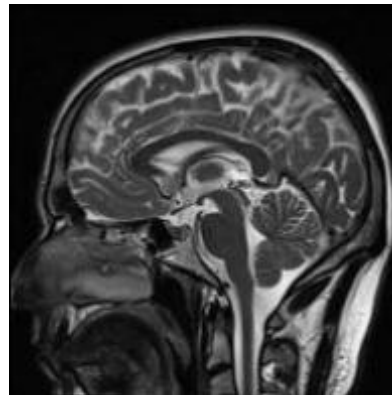
-180°C



# Magnet Resonance Imaging (MRI)

- **Research areas**
  - Neurodegenerative diseases
  - Cardiovascular diseases
  - Diabetes and other metabolic disorders
  - Musculoskeletal diseases
  - Cancer
- **MRI protocol**
  - Whole body
  - Heart
  - Brain
  - Bowel
  - Hip

Duration: ca. 60 min.



# Secondary/ Registry Data to Complement Primary GNC Data

90% consent for transfer of secondary/  
registry data

- **Statutory Health Insurances (SHI):** in- & outpatient treatment, drug prescriptions
- **Private Health Insurances (PHI):** in- & outpatient treatment, drug prescriptions
- **Central Research Institute of Ambulatory Health Care in Germany (Zi):** outpatient treatment, drug prescriptions
- **Institute for Employment Research (IAB):** periods of (un-)employment/ wage-replacement benefits
- **Statutory pension insurance institutions (DRV):** vocational and medical rehabilitation, status of pension, parental leave
- **Epidemiological and/or clinical cancer registries (CR):** diagnoses, therapies, survival
- **Advantages of secondary and registry data**
  - Reduce complexity & burden → shorter interviews, fewer questionnaires
  - Reduce missing data due to loss of participants (death, attrition, etc.)
  - Reduce recall bias due to invalid self-reports
  - Better quality of data regarding exposures & outcomes

# Legal Framework

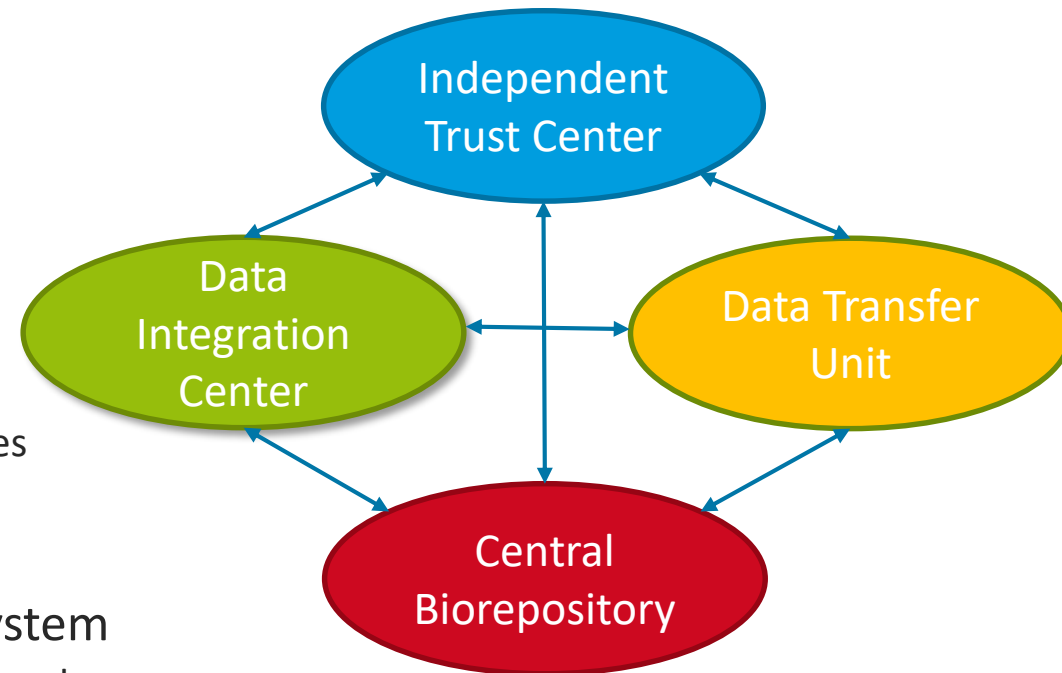
- **High demands on data protection** by German law:  
Data protection concept for the Competence Network for Secondary and Registry Data (CNSRD) as a whole and for each of the three nodes

	SHI	Zi	PHI	IAB	DRV	CR
Federal and State Data Protection Acts	X	X	X	X	X	X
Social Codebook II & III (SGB II & III)				X		
Social Codebook X (SGB X)	X	X		X		
State Cancer Registration Acts						X
German Criminal Code (GCC)			X			

- **Social security numbers**/ person identifying data are needed for data request
- **Informed consent** needed for each data source separately
- **Release from confidentiality** (§ 203 GCC) for the PHI data is needed
- **§ 75 SGB X applications** to be approved for social data (SHI, Zi, IAB)

# Data Management Centers

- Independent Trust Center
  - Curates all IDs and stores informed consents
  - Tests for duplicates GNC-wide
- Data Integration Center
  - Stores all research data
  - Programs the data acquisition tools
- Data Transfer Unit
  - Supports the applications for data biosamples
  - Prepares pseudonimised analysis datasets
- Biorepository
- Modular Control and Documentation System
  - Supports & documents recruitment at study centers
  - Monitors response
- Laboratory Information System
  - Records all steps of biosample processing, storage and shipment
- Competence Network Secondary and Registry Data
  - Negotiates with data owners and initiates data retrieval by data owners
  - Checks plausibility/ completeness of transferred data and ensures integrity of analysis data





# Use and access procedure

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- **Application:** PI, partners, other collaborators and their function, project title, study period, study aim, scientific rationale, project description, feasibility, available resources to conduct the study, details on data and samples to be collected
- **Submission:** transfer office
- **Evaluation:** Use and Access Committee
- **Final decision:** Board of Directors/ General Assembly

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**Thank you!**

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