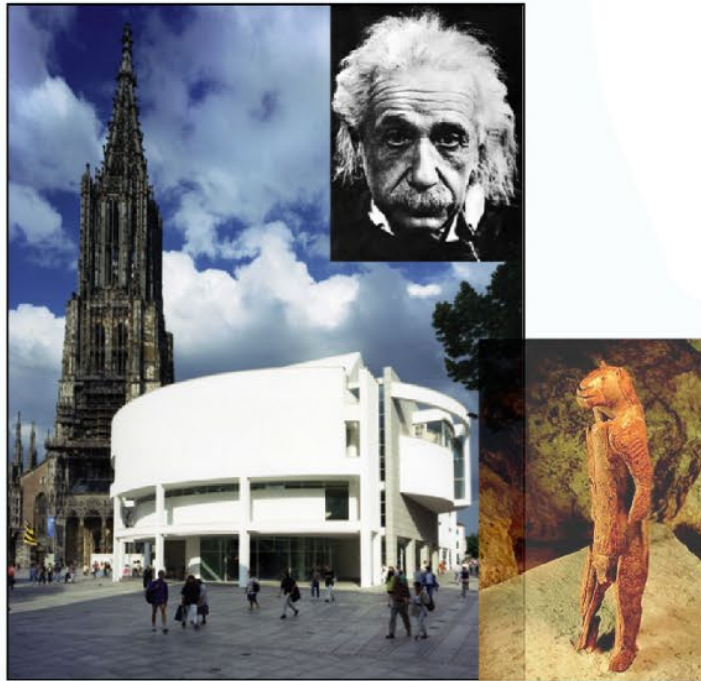


# TRADITION



# FUTURE

# RESEARCH



# Population based cohorts

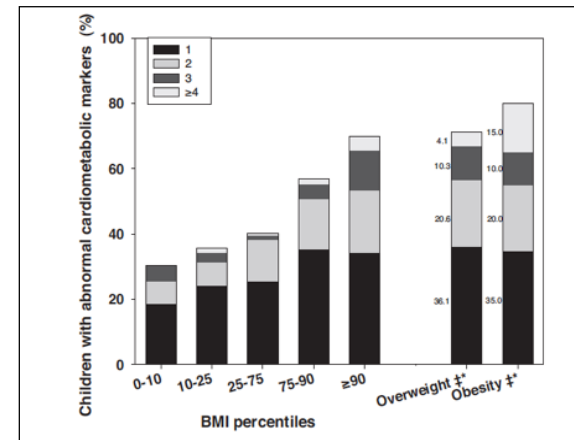
## Key questions/objectives

- Risk/protective factors for healthy weight and metabolism
- Somatic, psychosocial pathology

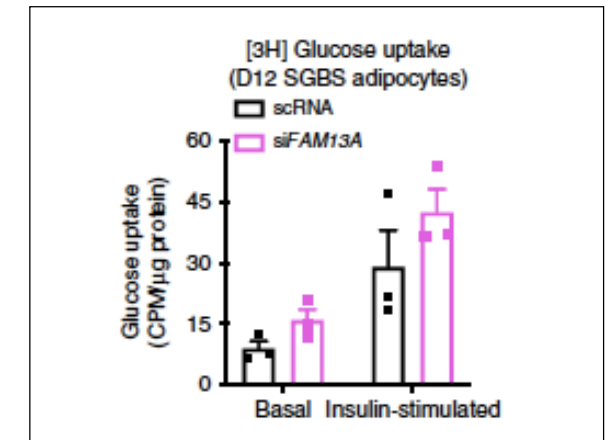
## Assets at UCH

- Two representative longitudinal UCH birth cohorts (including mother/child biobank)
- Statewide kindergarten and school\* cohort
- Nationwide follow-up neonatal screening on endocrine disorders
- Nationwide health insurance data (WIdO)

\* 7.000 teachers | 160.000 children and families per year

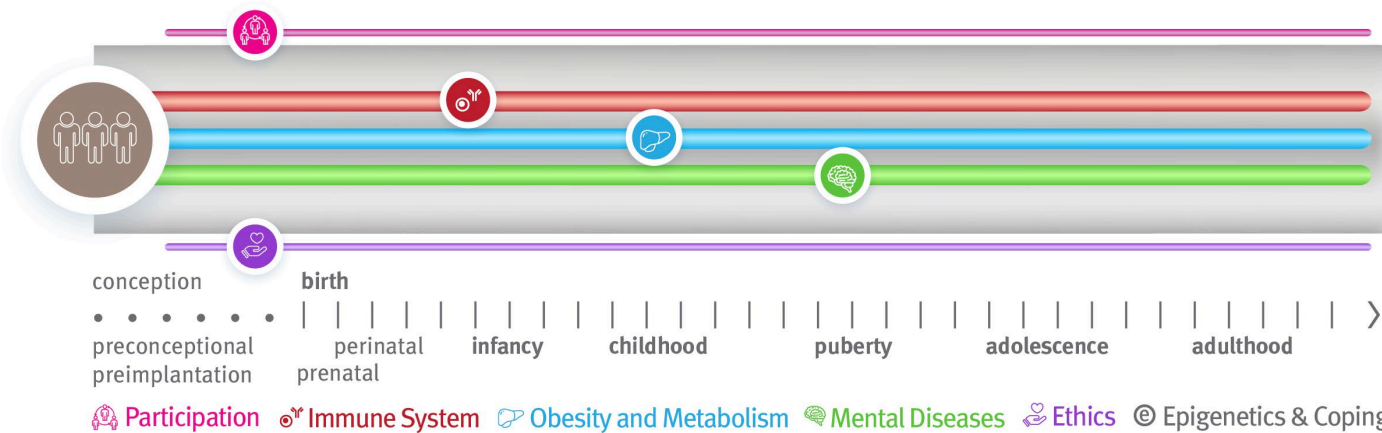


Cardio-vascular-risk factors in elementary school children (state cohort)



FAM13A affects fat distribution and adipocyte function

Nat Commun. 2020; 11: 1465



## Proposal for DZKJ

- National Cohort (development, biobank)
- Risk factors and digital interventions
- Dissemination and implementation research

# Obesity and metabolism

## Key questions/objectives

- Biologically defined obesity subtypes
- Prenatal metabolic programming
- Need for nationwide bio-psycho-social prevention

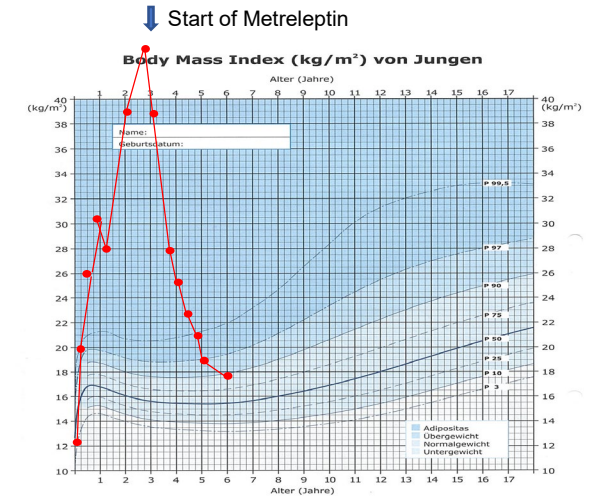
## Assets at UCH

- Nationwide obesity/diabetes registries
- Molecular and functional diagnostic platforms
- Structured care for pregnant women
- Statewide kindergarten/school-based prevention

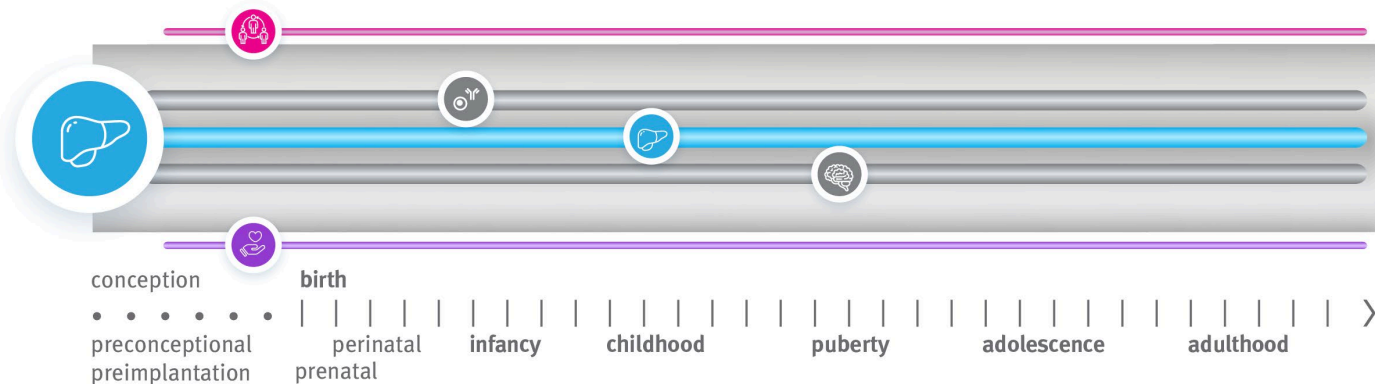


**Diabetes:**  
133.000 patients <18 yrs  
94% of total

**Obesity:**  
125.000 patients  
3.257 T2DM



**Biologically inactive leptin and early-onset extreme obesity**  
N Engl J Med 2015; 372: 48



## Proposal for DZKJ

- (EpiGen-)OMICs-based obesity subtypes
- UCH healthy metabolism pregnancy program
- Expanding UCH prevention program nationwide
- Stratified therapies in clinical studies
- Reframe, antistigmatisation, coping

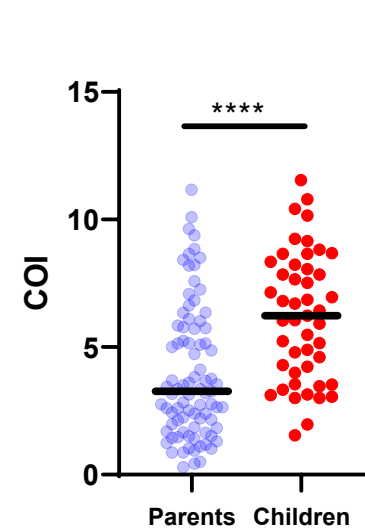
# Immune System and Cellular Therapy

## Key questions/objectives

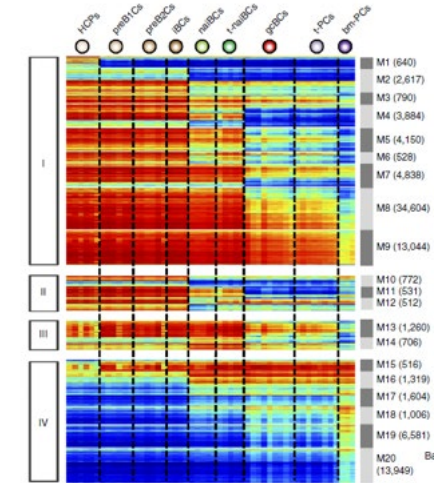
- Priming and checkpoints of immune development
- Somatic (epi)genetic variation of immunity
- Modulation of immunity by metabolism
- Detection of disturbed immune function and transition to malignancy

## Assets at UCH

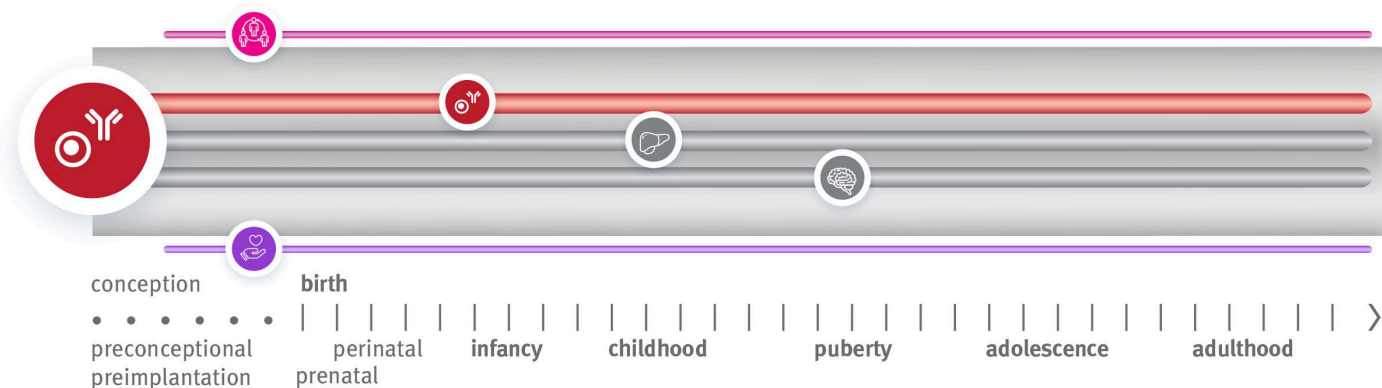
- Diagnostic platforms, cohorts, registries
- >1.000 pediatric stem cell transplantations (>30% PID)
- Extensive human and animal models
- Multi-OMICs immune phenotyping



SARS-CoV2 anti-Spike IgG  
in preparation



Methyome B-cell differentiation  
Within BLUEPRINT, Nat Genet 2015; 47: 746



## Proposal for DZKJ

- Understanding normal immune development
- Diagnostic criteria of immune dysfunction
- Improving cellular and gene therapy
- Coping with long-term immunedysfunction
- Screening for hemoglobinopathies

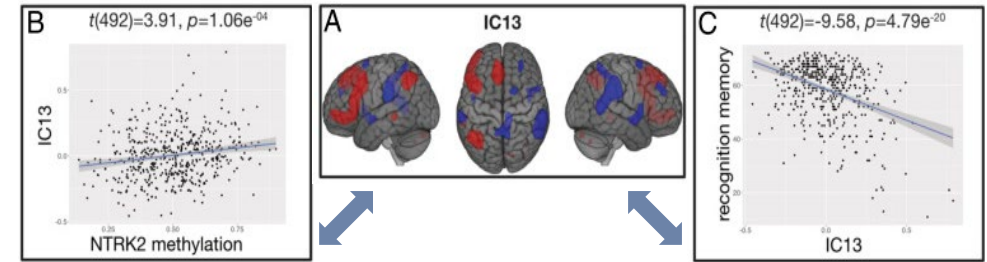
# Mental Diseases as Systemic Immuno-Metabolic Disorders

## Key questions/objectives

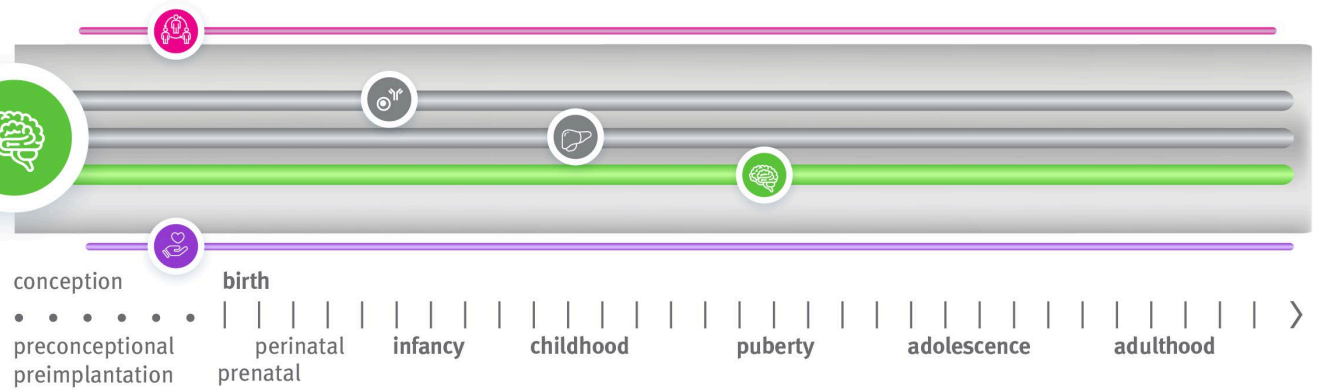
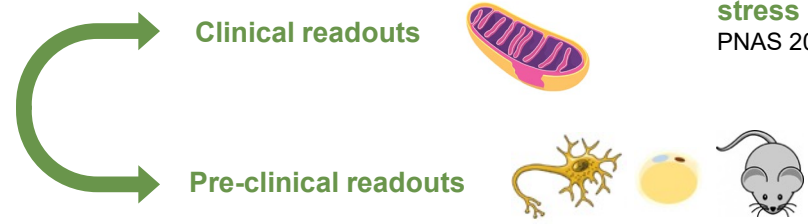
- Mental diseases as disturbed immunometabolism
- Prenatal priming of mental disease
- (Epi)genomic burden and mental disease
- Resilience as immunometabolic strength

## Assets at UCH

- Proof-of-concept evidence
- Comprehensive interdisciplinary methodology
- Preclinical model systems
- Patient cohorts and intervention studies



**NTRK2 methylation in post traumatic stress disorder**  
PNAS 2020; 117: 21667



### Proposal for DZKJ

- Characterization of mental-immunometabolic interface
- Multi-OMICs/-systems development and risk assessment
- Biological systems profiling as intervention measure
- Pre-clinical human readouts of immunometabolism

# Digital Behavioral Health and Coping

## Key questions/objectives

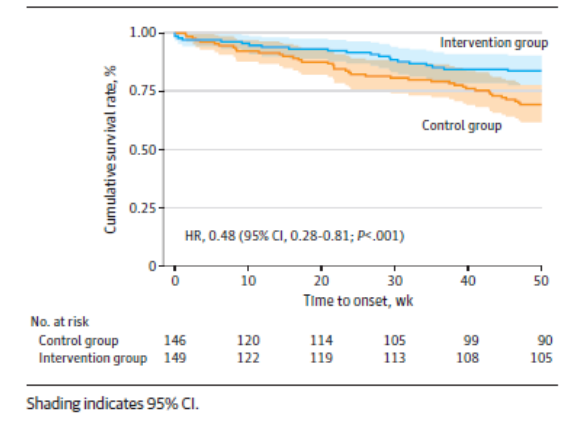
- Health and coping insights by smart sensing
- AI-enhanced innovations
- Nationally scalable implementation models

## Assets at UCH

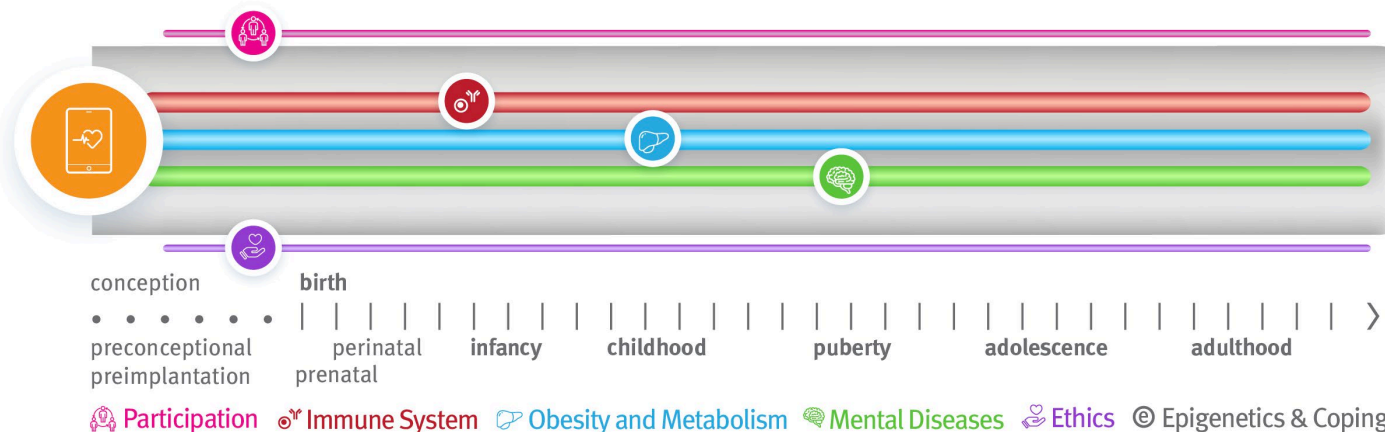
- Interoperable IT solutions and AI-ready databases
- Nationally largest body of digital behavioral youth health solutions
- Six interdisciplinary UU IT and trauma centres of competence
- Nationwide digital behavioral health network



eHealth Program Ulm University



**Time to Onset of Major Depressive Disorder in Back Pain**  
JAMA Psychiatry 2020; 77: 1001



## Proposal for DZKJ

- Digital Behavioral Health Hub as incubator within DZKJ
- Rapid innovation cycle from prototypes to implemented solutions
- Specific focus on diminishing health care gaps and disparities: Leave no one behind

## Core Facilities

- Pediatric Clinical Trials Center as part of ZKS
- Animal Research and Transgenic Mice
- Translational Imaging (electron, confocal and multiphoton, small animal, whole-body incl. PET/MRI, automatic high content)
- Omics (NGS, Affymetrix, Proteomics, Functional Peptidomics) and Bioinformatics
- Cytometry, including Mass Cytometry
- Metabolism (SeaHorse, Power-O2k, ESR)
- GMP-grade clean rooms
- Automatic Metabolic and Behavioral Phenotyping (mice)
- eSano Digital Health Intervention Platform

## Cooperation Partners on Campus, e.g.

- Institute for Diabetes Technology (IfDT)
- Boehringer Ingelheim Ulm University BioCenter (BIU)
- Institutes of Quantum Optics and Complex Quantum Systems

## Nation-wide patient registries

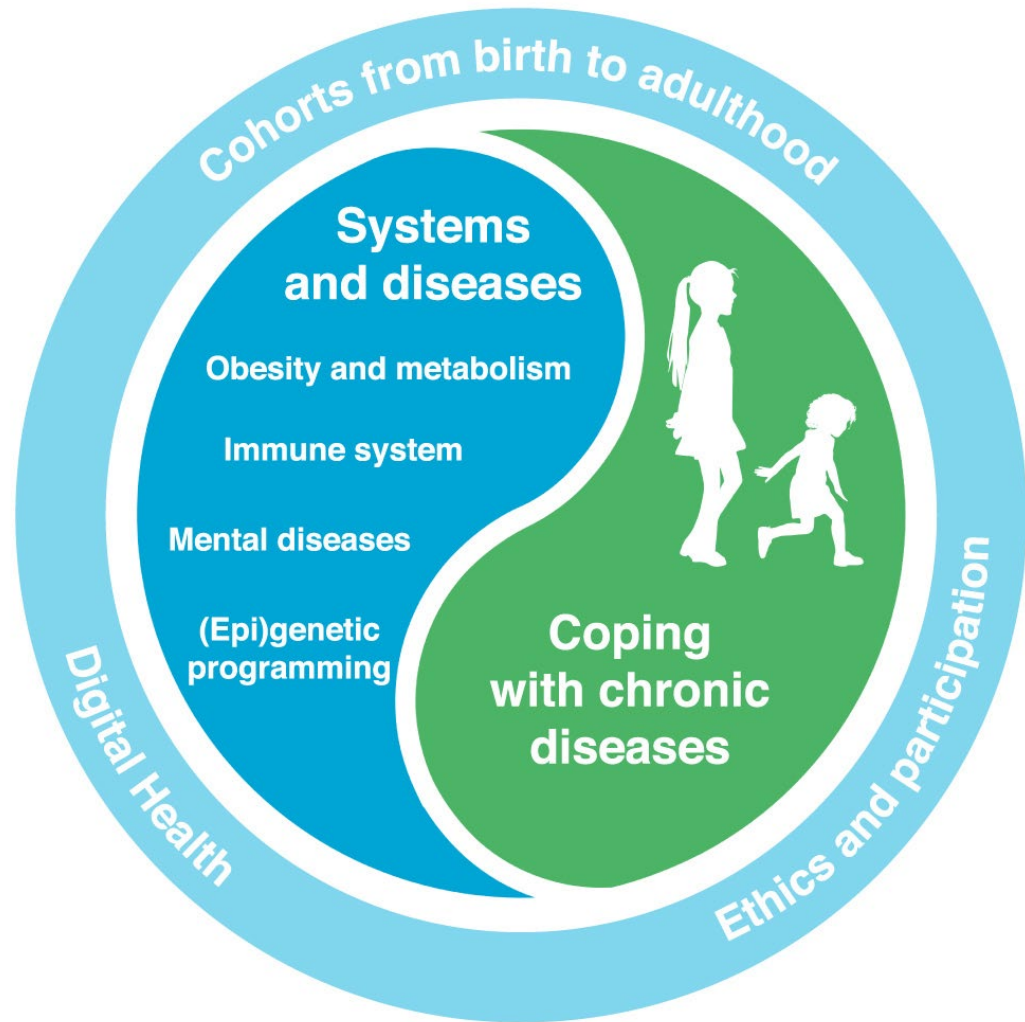
## Cohorts



Department of Pediatrics and Adolescent Medicine

## Proposal for DZKJ

- Sharing access to crucial technologies across sites
- Establishing cores within DZKJ when appropriate
- Improvement and development of new technologies, e.g. in the area of diabetes and quantum imaging
- Combining existing and establishing new cohorts



## Our vision for DZKJ:

Improving health and well-being of every child and adolescent from (pre-)birth to adult age.