

# The LIFE-Biobank – High Quality Biospecimen for Reproducible Research

Ronny Baber<sup>1,2</sup>, Juliane Dorow<sup>1,2</sup>, Alexander Kiel<sup>1</sup> and Joachim Thiery<sup>1,2</sup>

<sup>1</sup>LIFE – Leipzig Research Center for Civilization Diseases; University Leipzig; Leipzig; Germany

<sup>2</sup>Institute of Laboratory Medicine, Clinical Chemistry, and Molecular Diagnostics, University Hospital Leipzig; Leipzig; Germany

## Introduction

The quality requirements for biological samples in biomarker research have grown over the last years. This is due to new high resolution Omics-technologies and developments in precision medicine. However, samples with high and comparable quality are hard to find. This could lead to non-reproducible data or false associations.

Biobanks are important research infrastructures and can support preclinical and clinical research and developments in precision medicine. The Leipzig Research Center for Civilization Diseases (LIFE) is searching for molecular and lifestyle associated causes of civilization diseases. As one of the central institutions of the LIFE-project the LIFE-Biobank is supporting this aim by assuring high quality and standardized handling of all samples collected from participants of the population based cohorts (adults, children) and patients from selected disease cohorts (adults, children).

## General workflow

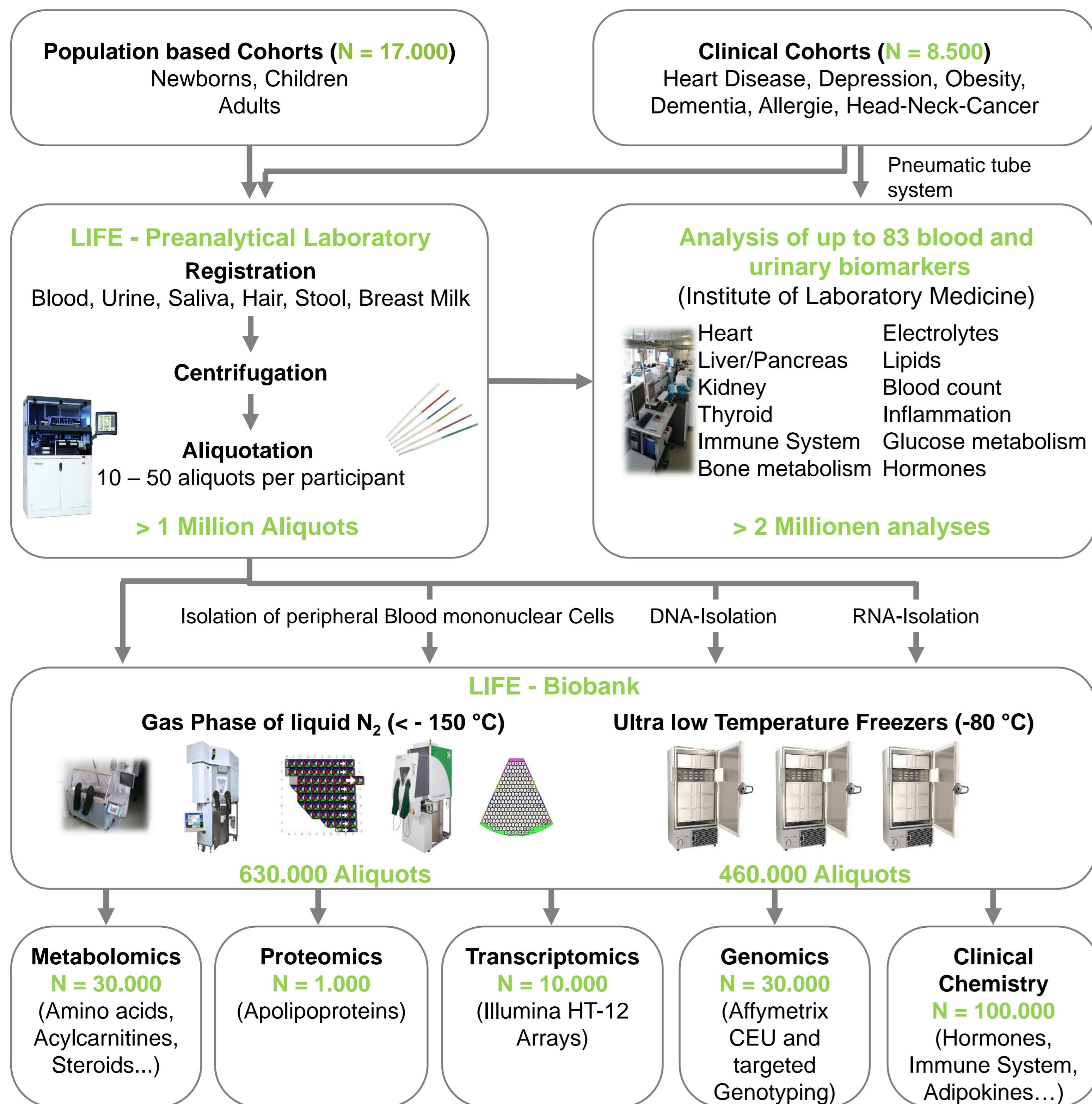


Figure 1. Sample workflow in the LIFE-Study

## Biobank workflow and collected Biomaterial

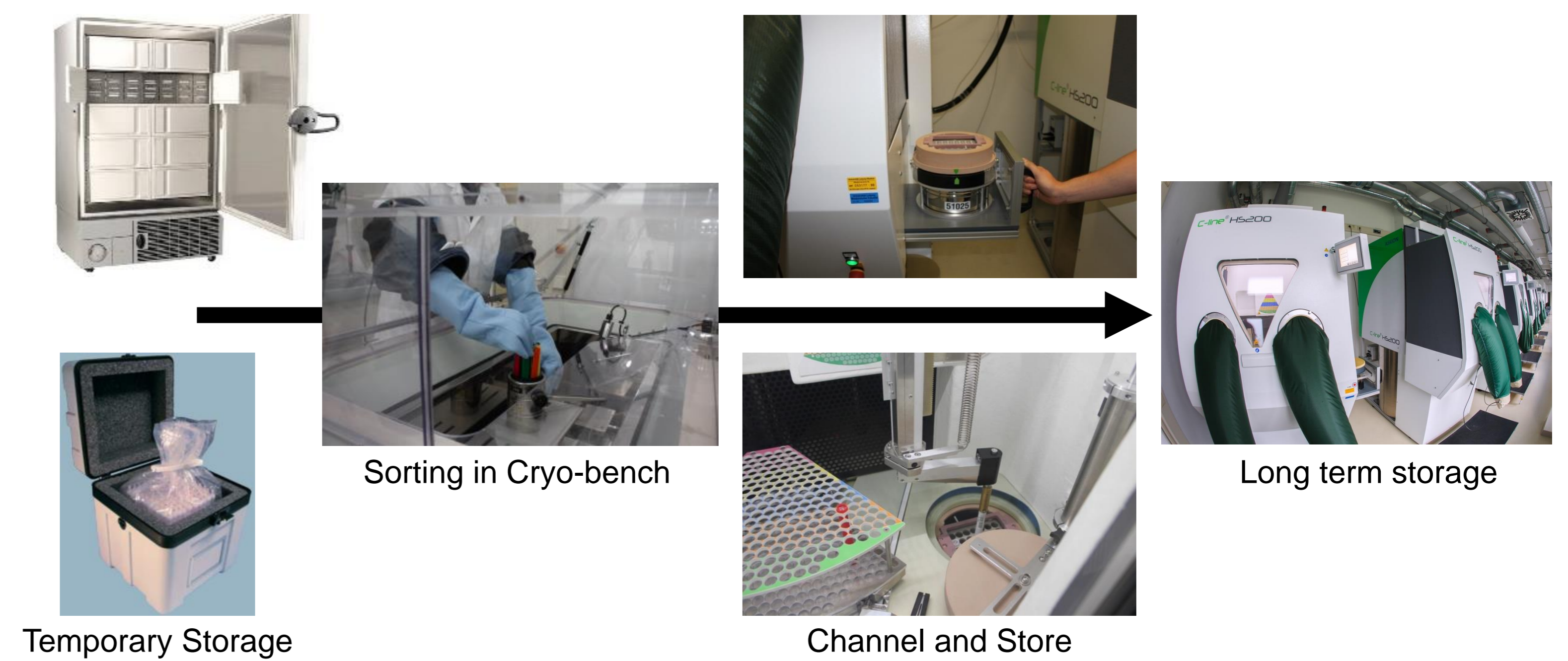


Figure 2. Biobank workflow in the LIFE-Study

Table 1: Overview of stored aliquots in different LIFE-cohorts (gas phase/ -80 °C)

Cohort	Visits	Participants	Serum	Plasma	Urine	Whole blood <sup>a</sup> (incl. stab.)	PBMCs	DNA + RNA
Adults (40 – 80 y)	10.400	10.400	152.000 / 32.000	148.000 / -	22.000 / 18.000	- / 66.000	15.900 / -	- / 30.000
Children (0 – 18 y) <sup>b</sup>	11.100	3.700	47.000 / 11.000	53.000 / 2.000	- / 50.000	- / 11.000	5.700 / -	- / 6.000
Parents <sup>b</sup>	3.700	2.300	27.000 / 1.100	25.000 / 1.100	- / 18.000	- / 5.200	1.700 / -	- / 7.000
(expectant) Mothers <sup>b,c</sup>	2.600	1.050	31.000 / 7.000	30.000 / 1.100	- / 14.000	- / 4.100	600 / -	- / 3.200
Heart	7.000	7.000	14.000 / 70.000	14.000 / 42.000	- / -	- / 31.000	14.000 / -	- / 21.000
Head-Neck-Cancer	630	370	4.200 / 3.300	3.000 / -	1.600 / -	- / 1.600	- / -	- / 610
Obese children <sup>b</sup>	650	320	7.000 / 5.600	5.000 / 200	- / 3.200	- / 900	170 / -	- / 1.300
Child depression	430	430	2.100 / -	1.300 / -	- / -	- / -	- / -	- / 430

<sup>a</sup>dried blood cards included; <sup>b</sup>hair stored at room temperature; <sup>c</sup>breast milk stored at -80 °C; PBMCs = peripheral blood mononuclear cells

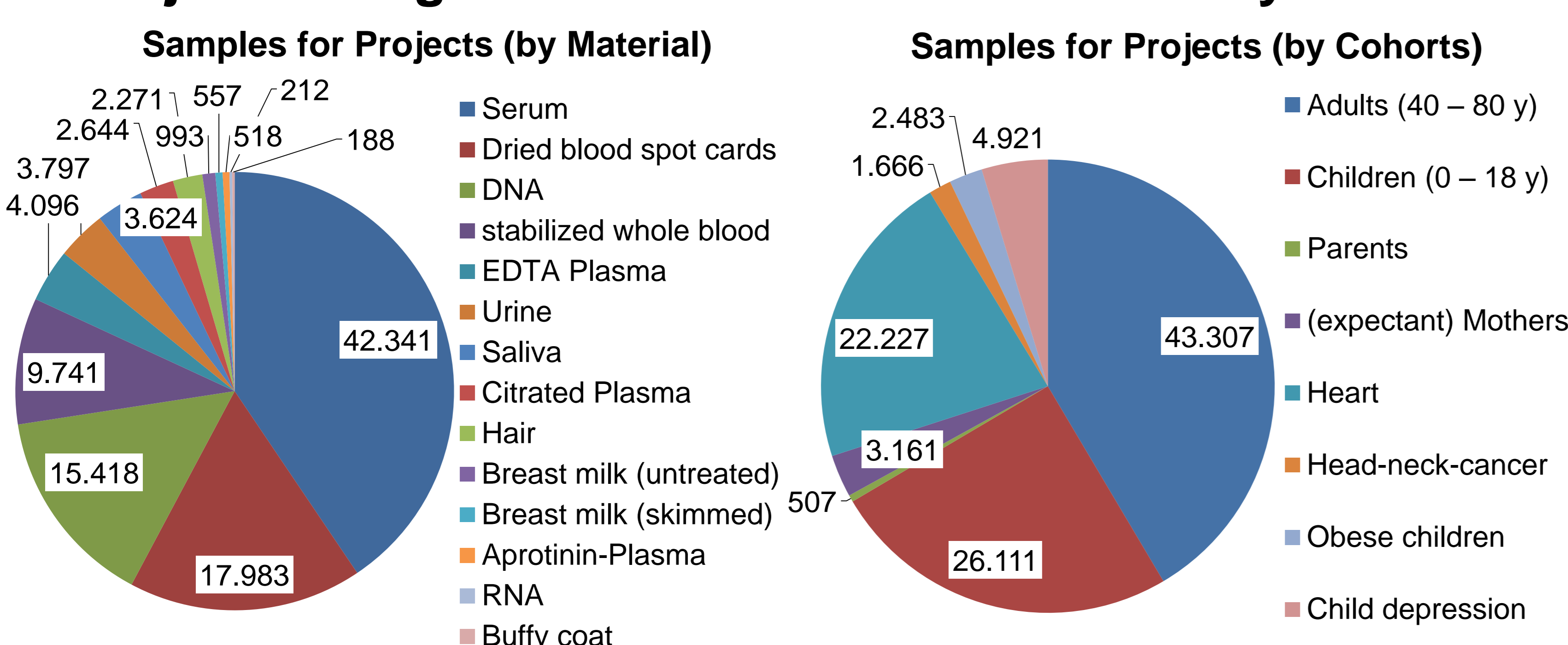
## Quality of collected Biomaterial

Table 2: Quality of different biomaterials in the LIFE-Study

Cohort	Serum			Serum Indices						DNA				RNA			
	Time of preparation <sup>a</sup> [min]	Mean	SD	Hemolytic Index	Icteric Index	Lipemic Index	Concentration [ng/μl]	260/280	260/230	Concentration [ng/μl]	260/280	260/230					
Adults (40 – 80 y)	99	52	9.444	4.8	2.0	1.0	272	1.88	1.99	228	2.1	1.8					
Children (0 – 18 y)	128	70	6.287	13.6	10.6	1.1	220	1.85	1.75	166	2.1	1.7					
Parents	118	69	2.826	-	-	-	199	1.88	2.03	-	-	-					
(expectant) Mothers	128	68	1.957	11.3	9.7	1.0	248	1.87	2.00	-	-	-					
Heart	310	71	2.293	9.5	7.7	1.1	326	1.88	2.05	225	2.1	1.8					
Head-Neck-Cancer	191	105	432	-	-	-	171	1.90	2.17	222	2.1	1.9					
Obese children	210	104	217	-	-	-	186	1.88	2.03	-	-	-					
Child depression	109	86	372	-	-	-	284	1.83	1.72	-	-	-					

<sup>a</sup>from blood withdrawal until freezing at -80 °C

## Projects using Biomaterial from the LIFE-Study



## Summary and Conclusion

The LIFE-Biobank uses cutting-edge technology for the preanalytic and analytic phase of the analytical process to ensure the highest quality of biospecimen for long term storage. The main principle of the LIFE-Biobank is the continuous cooling chain at very low temperatures to avoid any adverse effects on cells, proteins and metabolites.

The quality of the processed samples is assessed by using time stamps, HIL-indices and ratios of absorbance for nucleic acids. With this setting approximately 1.100.000 aliquots from 39.000 visits (25.000 participants) have been collected. Samples and data are available for researchers and around 350 projects have been realized using data and biospecimen from the LIFE-Study (171 projects using biomarker data and 49 projects also using biomaterial).