



UCL

National Child Development Study

Metabolomics

User Guide (Version 1)

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Centre for Longitudinal Studies

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About the National Child Development Study

The National Child Development Study (NCDS) is a longitudinal birth cohort study, following a nationally representative sample of over 17,000 people born in Britain in a single week in March 1958.

Cohort members have been surveyed throughout their lives, since birth, creating an exceptionally rich resource for a wide range of research. The study data show the long-lasting impact of childhood, how past experiences can reverberate through the years, and the interplay between different facets of people's lives.

NCDS has equipped policymakers with robust evidence in areas as diverse as smoking in pregnancy, educational inequalities, adult basic skills, and social mobility. Today, with the cohort now in their sixties, the study is casting light on how people experience retirement and ageing in the 21st century.

1. Introduction

The NCDS Age 62 Survey, (or 'Life in Your Early 60s' Survey as known to study members) was conducted between 2020 and 2024 when participants were aged 61-65 years. The Age 62 Survey involved an interview, a health visit, two paper self-completion questionnaires and an online dietary questionnaire.

During the health visit participants were asked to provide non-fasted blood samples. A maximum of five tubes of blood were taken. A full description of the blood sampling approach is provided in the NCDS Age 62 Survey User guide.

During fieldwork, assays of cholesterol (total and HDL), glycated haemoglobin, triglycerides and c-reactive protein (CRP) were conducted. Where consent was provided, blood was also stored for future analysis. Since fieldwork, assays of Troponin I, NT-proBNP and GDF-15 have been conducted. Results of these assays are available separately in the `ncds10_biomarkers.sav` dataset. This User Guide relates exclusively to the metabolomics analysis that was conducted. Metabolomics is the study of small molecules, or metabolites, within cells, tissues, or organisms, providing a snapshot of biochemical activity and physiological status.

2. Metabolomics assays

In total 7,774 NCDS cohort members were asked during their interview if they would be willing to be contacted by a Health Professional and 7,166 cohort members agreed to this. Of those who agreed to be visited, 6,309 took part in the Health Visit. 5,966 were eligible to provide a blood sample and 5,149 agreed to do so (and a blood sample was received and analysed). 5,071 agreed for their blood to be stored for future analysis.

The metabolomics analysis was conducted by Nightingale Health using samples of serum. The serum tubes were collected by health professionals in the homes of participants where they were centrifuged prior to being posted to the Bristol Bioresource Laboratory (BBL), where samples were stored in 0.5 ml aliquots at -80°C. Serum samples were available for 5,082 participants. One aliquot per participant was shipped to Nightingale Health (Helsinki, Finland) from BBL.

The method used to conduct the metabolomics assay was Nightingale Health's proprietary ^1H NMR Spectroscopy, where 250 biomarkers were quantified (Appendix 1).

Of the 5,084 results from the samples returned, of which 2 were control samples, 5,022 were retained in the dataset following exclusions due to assay failure, reidentification discrepancies, and participant consent withdrawal.

3. Research Data

3.1 Licensing and data access

The NCDS metabolomics dataset has been processed by CLS and supplied to the UK Data Service. All data users need to be registered with the UK Data Service and sign the UKDS End User Licence. Details of how to do this are available at ukdataservice.ac.uk/get-data/how-to-access/registration.

The NCDS metabolomics dataset is available as special safeguarded data at the UK Data Service. This dataset can be requested using the UK Data Service Special Licence application form. Once the form has been reviewed by the UK Data Service and approved by the CLS Data Access Committee, the data will be available to download.

The CLS data excludes detailed information that is sensitive or presents a potential risk for disclosivity, such as the sample barcode ID linked to the Nurse dataset.

3.2 Dataset

The dataset follows a flat structure, where each row corresponds to a unique cohort member. Each column represents either a metabolite measurement or a quality control (QC) flag.

Table 1: List of available datasets

Dataset name	Content summary
ncds10_metabolomics_v1.sav	A panel of 250 metabolites measurements and 21 QC flags

3.3 Data documentation

Full validation data information is available in the following documents:

Table 2: Data documents

Name of the document	Content summary
NCDS10_Metabolomics_Quality_Report.pdf	Summary of quality observations, quality control tags and explanations, and biomarker measurement success rates for the cohort analysed by Nightingale (N=5084, pre-exclusions)
NCDS10_Metabolomics_Results_Overview.pdf	Distribution of biomarker concentrations by category, lipid composition of lipoprotein subclasses, and heatmap of biomarker cross-correlations for the cohort analysed by Nightingale (N=5084, pre-exclusions)

3.4 Identifiers

For NCDS, the data are identified with NCDSID, which is the same research IDs used for the rest of cohort data available at the UK Data Service. This enables the data to be merged with one another.

3.5 Dataset curation

The dataset was identified with Sample ID barcodes that were collected as part of the NCDS10 Nurse dataset. During data processing, two sample controls were removed. The missing values were recoded (Section 3.7) and data was reidentified with the UKDS research ID (NCDSID). No documentation of normalization procedures has been provided by the lab.

3.6 Dataset description

The order of variables in the dataset is as provided by the lab, with each variable representing a metabolite measurement or a quality control (QC) flag.

3.6.1 Variable names

The variable names are as provided by the lab, in lowercase. The variable labels indicate the full metabolite name, the unit of measurement, and whether the variable

is a quality control flag (labelled “QC flag”). The full list of all the metabolites is available in Appendix 1.

Table 3: Variable description

Variable Name	Variable Label
ncdsid	NCDS Research ID
total_c	Cholesterol: Total cholesterol (mmol/L)
...	...
s_hdl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in small HDL (%)
edta_plasma	QC tags: EDTA plasma
...	...
below_limit_of_quantification	QC tags: Below limit of quantification

3.6.2 Value labels

For the QC flags, the value labels provide information about sample status rather than a quantifiable measurement. Specifically, they indicate:

- Whether the samples are positive for a given QC flag
- The reason the sample was flagged

These labels serve as categorical indicators rather than numerical values.

3.7 Data errors and inconsistencies

Users should be aware of the following data corrections and potential inconsistencies:

3.7.1 Measurement outliers

- Extreme metabolite values may indicate experimental anomalies rather than true biological variation.
- Values outside plausible physiological ranges which may require verification.
- 9 samples indicate presence of EDTA in the plasma sample. EDTA interferes with the quantification of glycerol, glycine, and pyruvate. Metabolites may behave

differently (in absolute concentration terms and possible in association terms) in serum versus EDTA plasma due to the different biological matrices.

3.7.2 Missing or incomplete data

- Negative missing values indicating below LOD or unmeasured metabolites. For metabolite variables, negative missing values indicate:
 - The measurement for the specific sample and metabolite is missing due to QC or sample quality, or
 - The value is below the limit of detection (LOD), or
 - The sample was not measured for that metabolite

3.7.3 Unit and scaling differences

- Variations in concentration units across assays.
- Possible need for normalization or standardization to ensure compatibility.

3.8 Handling missing values in metabolomics data

The appropriate handling method should be selected based on the study objectives and analytical approach as the options presented serve as considerations for researchers designing their analysis and are not prescriptive.

Researcher could replace missing values with LOD / 2 (commonly used in biomarker analyses) or use principled methods such as multiple imputation, full information maximum likelihood or inverse probability weighting as outlined in the CLS Handling Missing Data User Guide².

4. References

1. **Welsh, P., & Beazer, J.D.** (University of Glasgow, Glasgow Biomarker Research Unit). *Direct communication regarding manufacturer thresholds, assay parameters, and disease threshold write-up.*
2. **Silverwood, R., Narayanan, M., Dodgeon, B., Katsoulis, M., Ploubidis, G.** (2024) Handling missing data in the CLS cohort studies: User guide. London: UCL Centre for Longitudinal Studies.

Appendix 1: List of variables in the metabolomics dataset

Order	Variable name	Variable label
1	ncdsid	NCDS Research ID
2	total_c	Cholesterol: Total cholesterol (mmol/L)
3	non_hdl_c	Cholesterol: Total cholesterol minus HDL-C (mmol/L)
4	remnant_c	Cholesterol: Remnant cholesterol (non-HDL, non-LDL -cholesterol) (mmol/L)
5	vldl_c	Cholesterol: VLDL cholesterol (mmol/L)
6	clinical_ldl_c	Cholesterol: Clinical LDL cholesterol (mmol/L)
7	ldl_c	Cholesterol: LDL cholesterol (mmol/L)
8	hdl_c	Cholesterol: HDL cholesterol (mmol/L)
9	total_tg	Triglycerides: Total triglycerides (mmol/L)
10	vldl_tg	Triglycerides: Triglycerides in VLDL (mmol/L)
11	ldl_tg	Triglycerides: Triglycerides in LDL (mmol/L)
12	hdl_tg	Triglycerides: Triglycerides in HDL (mmol/L)
13	total_pl	Phospholipids: Total phospholipids in lipoprotein particles (mmol/L)
14	vldl_pl	Phospholipids: Phospholipids in VLDL (mmol/L)
15	ldl_pl	Phospholipids: Phospholipids in LDL (mmol/L)
16	hdl_pl	Phospholipids: Phospholipids in HDL (mmol/L)
17	total_ce	Cholesteryl esters: Total esterified cholesterol (mmol/L)
18	vldl_ce	Cholesteryl esters: Cholesteryl esters in VLDL (mmol/L)
19	ldl_ce	Cholesteryl esters: Cholesteryl esters in LDL (mmol/L)
20	hdl_ce	Cholesteryl esters: Cholesteryl esters in HDL (mmol/L)
21	total_fc	Free cholesterol: Total free cholesterol (mmol/L)
22	vldl_fc	Free cholesterol: Free cholesterol in VLDL (mmol/L)
23	ldl_fc	Free cholesterol: Free cholesterol in LDL (mmol/L)
24	hdl_fc	Free cholesterol: Free cholesterol in HDL (mmol/L)
25	total_l	Total lipids: Total lipids in lipoprotein particles (mmol/L)
26	vldl_l	Total lipids: Total lipids in VLDL (mmol/L)
27	ldl_l	Total lipids: Total lipids in LDL (mmol/L)
28	hdl_l	Total lipids: Total lipids in HDL (mmol/L)
29	total_p	Lipoprotein particle concentrations: Total concentration of lipoprotein particles (mmol/L)
30	vldl_p	Lipoprotein particle concentrations: Concentration of VLDL particles (mmol/L)

31	ldl_p	Lipoprotein particle concentrations: Concentration of LDL particles (mmol/L)
32	hdl_p	Lipoprotein particle concentrations: Concentration of HDL particles (mmol/L)
33	vldl_size	Lipoprotein particle sizes: Average diameter for VLDL particles (nm)
34	ldl_size	Lipoprotein particle sizes: Average diameter for LDL particles (nm)
35	hdl_size	Lipoprotein particle sizes: Average diameter for HDL particles (nm)
36	phosphoglyc	Other lipids: Phosphoglycerides (mmol/L)
37	tg_by_pg	Other lipids: Ratio of triglycerides to phosphoglycerides (ratio)
38	cholines	Other lipids: Total cholines (mmol/L)
39	phosphatidylc	Other lipids: Phosphatidylcholines (mmol/L)
40	sphingomyelins	Other lipids: Sphingomyelins (mmol/L)
41	apob	Apolipoproteins: Apolipoprotein B (g/L)
42	apoa1	Apolipoproteins: Apolipoprotein A1 (g/L)
43	apob_by_apoa1	Apolipoproteins: Ratio of apolipoprotein B to apolipoprotein A1 (ratio)
44	total_fa	Fatty acids: Total fatty acids (mmol/L)
45	unsaturation	Fatty acids: Degree of unsaturation (degree)
46	omega_3	Fatty acids: Omega-3 fatty acids (mmol/L)
47	omega_6	Fatty acids: Omega-6 fatty acids (mmol/L)
48	pufa	Fatty acids: Polyunsaturated fatty acids (mmol/L)
49	mufa	Fatty acids: Monounsaturated fatty acids (mmol/L)
50	sfa	Fatty acids: Saturated fatty acids (mmol/L)
51	la	Fatty acids: Linoleic acid (mmol/L)
52	dha	Fatty acids: Docosahexaenoic acid (mmol/L)
53	omega_3_pct	Fatty acids: Ratio of omega-3 fatty acids to total fatty acids (%)
54	omega_6_pct	Fatty acids: Ratio of omega-6 fatty acids to total fatty acids (%)
55	pufa_pct	Fatty acids: Ratio of polyunsaturated fatty acids to total fatty acids (%)
56	mufa_pct	Fatty acids: Ratio of monounsaturated fatty acids to total fatty acids (%)
57	sfa_pct	Fatty acids: Ratio of saturated fatty acids to total fatty acids (%)
58	la_pct	Fatty acids: Ratio of linoleic acid to total fatty acids (%)
59	dha_pct	Fatty acids: Ratio of docosahexaenoic acid to total fatty acids (%)
60	pufa_by_mufa	Fatty acids: Ratio of polyunsaturated fatty acids to monounsaturated fatty acids (ratio)
61	omega_6_by_omega_3	Fatty acids: Ratio of omega-6 fatty acids to omega-3 fatty acids (ratio)
62	ala	Amino acids: Alanine (mmol/L)
63	gln	Amino acids: Glutamine (mmol/L)
64	gly	Amino acids: Glycine (mmol/L)
65	his	Amino acids: Histidine (mmol/L)
66	total_bcaa	Amino acids: Total concentration of branched-chain amino acids (leucine + isoleucine + valine) (mmol/L)
67	ile	Amino acids: Isoleucine (mmol/L)

68	leu	Amino acids: Leucine (mmol/L)
69	val	Amino acids: Valine (mmol/L)
70	phe	Amino acids: Phenylalanine (mmol/L)
71	tyr	Amino acids: Tyrosine (mmol/L)
72	glucose	Glycolysis related metabolites: Glucose (mmol/L)
73	lactate	Glycolysis related metabolites: Lactate (mmol/L)
74	pyruvate	Glycolysis related metabolites: Pyruvate (mmol/L)
75	citrate	Glycolysis related metabolites: Citrate (mmol/L)
76	glycerol	Glycolysis related metabolites: Glycerol (mmol/L)
77	bohbutyrate	Ketone bodies: 3-Hydroxybutyrate (mmol/L)
78	acetate	Ketone bodies: Acetate (mmol/L)
79	acetoacetate	Ketone bodies: Acetoacetate (mmol/L)
80	acetone	Ketone bodies: Acetone (mmol/L)
81	creatinine	Fluid balance: Creatinine (mmol/L)
82	albumin	Fluid balance: Albumin (g/L)
83	glyca	Inflammation: Glycoprotein acetyls (mmol/L)
84	xxl_vldl_p	Lipoprotein subclasses: Concentration of chylomicrons and extremely large VLDL particles (mmol/L)
85	xxl_vldl_l	Lipoprotein subclasses: Total lipids in chylomicrons and extremely large VLDL (mmol/L)
86	xxl_vldl_pl	Lipoprotein subclasses: Phospholipids in chylomicrons and extremely large VLDL (mmol/L)
87	xxl_vldl_c	Lipoprotein subclasses: Cholesterol in chylomicrons and extremely large VLDL (mmol/L)
88	xxl_vldl_ce	Lipoprotein subclasses: Cholesteryl esters in chylomicrons and extremely large VLDL (mmol/L)
89	xxl_vldl_fc	Lipoprotein subclasses: Free cholesterol in chylomicrons and extremely large VLDL (mmol/L)
90	xxl_vldl_tg	Lipoprotein subclasses: Triglycerides in chylomicrons and extremely large VLDL (mmol/L)
91	xl_vldl_p	Lipoprotein subclasses: Concentration of very large VLDL particles (mmol/L)
92	xl_vldl_l	Lipoprotein subclasses: Total lipids in very large VLDL (mmol/L)
93	xl_vldl_pl	Lipoprotein subclasses: Phospholipids in very large VLDL (mmol/L)
94	xl_vldl_c	Lipoprotein subclasses: Cholesterol in very large VLDL (mmol/L)
95	xl_vldl_ce	Lipoprotein subclasses: Cholesteryl esters in very large VLDL (mmol/L)
96	xl_vldl_fc	Lipoprotein subclasses: Free cholesterol in very large VLDL (mmol/L)
97	xl_vldl_tg	Lipoprotein subclasses: Triglycerides in very large VLDL (mmol/L)
98	l_vldl_p	Lipoprotein subclasses: Concentration of large VLDL particles (mmol/L)
99	l_vldl_l	Lipoprotein subclasses: Total lipids in large VLDL (mmol/L)
100	l_vldl_pl	Lipoprotein subclasses: Phospholipids in large VLDL (mmol/L)
101	l_vldl_c	Lipoprotein subclasses: Cholesterol in large VLDL (mmol/L)

102	l_vldl_ce	Lipoprotein subclasses: Cholesteryl esters in large VLDL (mmol/L)
103	l_vldl_fc	Lipoprotein subclasses: Free cholesterol in large VLDL (mmol/L)
104	l_vldl_tg	Lipoprotein subclasses: Triglycerides in large VLDL (mmol/L)
105	m_vldl_p	Lipoprotein subclasses: Concentration of medium VLDL particles (mmol/L)
106	m_vldl_l	Lipoprotein subclasses: Total lipids in medium VLDL (mmol/L)
107	m_vldl_pl	Lipoprotein subclasses: Phospholipids in medium VLDL (mmol/L)
108	m_vldl_c	Lipoprotein subclasses: Cholesterol in medium VLDL (mmol/L)
109	m_vldl_ce	Lipoprotein subclasses: Cholesteryl esters in medium VLDL (mmol/L)
110	m_vldl_fc	Lipoprotein subclasses: Free cholesterol in medium VLDL (mmol/L)
111	m_vldl_tg	Lipoprotein subclasses: Triglycerides in medium VLDL (mmol/L)
112	s_vldl_p	Lipoprotein subclasses: Concentration of small VLDL particles (mmol/L)
113	s_vldl_l	Lipoprotein subclasses: Total lipids in small VLDL (mmol/L)
114	s_vldl_pl	Lipoprotein subclasses: Phospholipids in small VLDL (mmol/L)
115	s_vldl_c	Lipoprotein subclasses: Cholesterol in small VLDL (mmol/L)
116	s_vldl_ce	Lipoprotein subclasses: Cholesteryl esters in small VLDL (mmol/L)
117	s_vldl_fc	Lipoprotein subclasses: Free cholesterol in small VLDL (mmol/L)
118	s_vldl_tg	Lipoprotein subclasses: Triglycerides in small VLDL (mmol/L)
119	xs_vldl_p	Lipoprotein subclasses: Concentration of very small VLDL particles (mmol/L)
120	xs_vldl_l	Lipoprotein subclasses: Total lipids in very small VLDL (mmol/L)
121	xs_vldl_pl	Lipoprotein subclasses: Phospholipids in very small VLDL (mmol/L)
122	xs_vldl_c	Lipoprotein subclasses: Cholesterol in very small VLDL (mmol/L)
123	xs_vldl_ce	Lipoprotein subclasses: Cholesteryl esters in very small VLDL (mmol/L)
124	xs_vldl_fc	Lipoprotein subclasses: Free cholesterol in very small VLDL (mmol/L)
125	xs_vldl_tg	Lipoprotein subclasses: Triglycerides in very small VLDL (mmol/L)
126	idl_p	Lipoprotein subclasses: Concentration of IDL particles (mmol/L)
127	idl_l	Lipoprotein subclasses: Total lipids in IDL (mmol/L)
128	idl_pl	Lipoprotein subclasses: Phospholipids in IDL (mmol/L)
129	idl_c	Lipoprotein subclasses: Cholesterol in IDL (mmol/L)
130	idl_ce	Lipoprotein subclasses: Cholesteryl esters in IDL (mmol/L)
131	idl_fc	Lipoprotein subclasses: Free cholesterol in IDL (mmol/L)
132	idl_tg	Lipoprotein subclasses: Triglycerides in IDL (mmol/L)
133	l_ldl_p	Lipoprotein subclasses: Concentration of large LDL particles (mmol/L)
134	l_ldl_l	Lipoprotein subclasses: Total lipids in large LDL (mmol/L)
135	l_ldl_pl	Lipoprotein subclasses: Phospholipids in large LDL (mmol/L)
136	l_ldl_c	Lipoprotein subclasses: Cholesterol in large LDL (mmol/L)
137	l_ldl_ce	Lipoprotein subclasses: Cholesteryl esters in large LDL (mmol/L)
138	l_ldl_fc	Lipoprotein subclasses: Free cholesterol in large LDL (mmol/L)
139	l_ldl_tg	Lipoprotein subclasses: Triglycerides in large LDL (mmol/L)

140	m_ldl_p	Lipoprotein subclasses: Concentration of medium LDL particles (mmol/L)
141	m_ldl_l	Lipoprotein subclasses: Total lipids in medium LDL (mmol/L)
142	m_ldl_pl	Lipoprotein subclasses: Phospholipids in medium LDL (mmol/L)
143	m_ldl_c	Lipoprotein subclasses: Cholesterol in medium LDL (mmol/L)
144	m_ldl_ce	Lipoprotein subclasses: Cholesteryl esters in medium LDL (mmol/L)
145	m_ldl_fc	Lipoprotein subclasses: Free cholesterol in medium LDL (mmol/L)
146	m_ldl_tg	Lipoprotein subclasses: Triglycerides in medium LDL (mmol/L)
147	s_ldl_p	Lipoprotein subclasses: Concentration of small LDL particles (mmol/L)
148	s_ldl_l	Lipoprotein subclasses: Total lipids in small LDL (mmol/L)
149	s_ldl_pl	Lipoprotein subclasses: Phospholipids in small LDL (mmol/L)
150	s_ldl_c	Lipoprotein subclasses: Cholesterol in small LDL (mmol/L)
151	s_ldl_ce	Lipoprotein subclasses: Cholesteryl esters in small LDL (mmol/L)
152	s_ldl_fc	Lipoprotein subclasses: Free cholesterol in small LDL (mmol/L)
153	s_ldl_tg	Lipoprotein subclasses: Triglycerides in small LDL (mmol/L)
154	xl_hdl_p	Lipoprotein subclasses: Concentration of very large HDL particles (mmol/L)
155	xl_hdl_l	Lipoprotein subclasses: Total lipids in very large HDL (mmol/L)
156	xl_hdl_pl	Lipoprotein subclasses: Phospholipids in very large HDL (mmol/L)
157	xl_hdl_c	Lipoprotein subclasses: Cholesterol in very large HDL (mmol/L)
158	xl_hdl_ce	Lipoprotein subclasses: Cholesteryl esters in very large HDL (mmol/L)
159	xl_hdl_fc	Lipoprotein subclasses: Free cholesterol in very large HDL (mmol/L)
160	xl_hdl_tg	Lipoprotein subclasses: Triglycerides in very large HDL (mmol/L)
161	l_hdl_p	Lipoprotein subclasses: Concentration of large HDL particles (mmol/L)
162	l_hdl_l	Lipoprotein subclasses: Total lipids in large HDL (mmol/L)
163	l_hdl_pl	Lipoprotein subclasses: Phospholipids in large HDL (mmol/L)
164	l_hdl_c	Lipoprotein subclasses: Cholesterol in large HDL (mmol/L)
165	l_hdl_ce	Lipoprotein subclasses: Cholesteryl esters in large HDL (mmol/L)
166	l_hdl_fc	Lipoprotein subclasses: Free cholesterol in large HDL (mmol/L)
167	l_hdl_tg	Lipoprotein subclasses: Triglycerides in large HDL (mmol/L)
168	m_hdl_p	Lipoprotein subclasses: Concentration of medium HDL particles (mmol/L)
169	m_hdl_l	Lipoprotein subclasses: Total lipids in medium HDL (mmol/L)
170	m_hdl_pl	Lipoprotein subclasses: Phospholipids in medium HDL (mmol/L)
171	m_hdl_c	Lipoprotein subclasses: Cholesterol in medium HDL (mmol/L)
172	m_hdl_ce	Lipoprotein subclasses: Cholesteryl esters in medium HDL (mmol/L)
173	m_hdl_fc	Lipoprotein subclasses: Free cholesterol in medium HDL (mmol/L)
174	m_hdl_tg	Lipoprotein subclasses: Triglycerides in medium HDL (mmol/L)
175	s_hdl_p	Lipoprotein subclasses: Concentration of small HDL particles (mmol/L)
176	s_hdl_l	Lipoprotein subclasses: Total lipids in small HDL (mmol/L)
177	s_hdl_pl	Lipoprotein subclasses: Phospholipids in small HDL (mmol/L)

178	s_hdl_c	Lipoprotein subclasses: Cholesterol in small HDL (mmol/L)
179	s_hdl_ce	Lipoprotein subclasses: Cholesteryl esters in small HDL (mmol/L)
180	s_hdl_fc	Lipoprotein subclasses: Free cholesterol in small HDL (mmol/L)
181	s_hdl_tg	Lipoprotein subclasses: Triglycerides in small HDL (mmol/L)
182	xxl_vldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in chylomicrons and extremely large VLDL (%)
183	xxl_vldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in chylomicrons and extremely large VLDL (%)
184	xxl_vldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in chylomicrons and extremely large VLDL (%)
185	xxl_vldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in chylomicrons and extremely large VLDL (%)
186	xxl_vldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in chylomicrons and extremely large VLDL (%)
187	xl_vldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in very large VLDL (%)
188	xl_vldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in very large VLDL (%)
189	xl_vldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in very large VLDL (%)
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194	l_vldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in large VLDL (%)
195	l_vldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in large VLDL (%)
196	l_vldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in large VLDL (%)
197	m_vldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in medium VLDL (%)
198	m_vldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in medium VLDL (%)
199	m_vldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in medium VLDL (%)
200	m_vldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in medium VLDL (%)
201	m_vldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in medium VLDL (%)

202	s_vldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in small VLDL (%)
203	s_vldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in small VLDL (%)
204	s_vldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in small VLDL (%)
205	s_vldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in small VLDL (%)
206	s_vldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in small VLDL (%)
207	xs_vldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in very small VLDL (%)
208	xs_vldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in very small VLDL (%)
209	xs_vldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in very small VLDL (%)
210	xs_vldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in very small VLDL (%)
211	xs_vldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in very small VLDL (%)
212	idl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in IDL (%)
213	idl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in IDL (%)
214	idl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in IDL (%)
215	idl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in IDL (%)
216	idl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in IDL (%)
217	l_ldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in large LDL (%)
218	l_ldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in large LDL (%)
219	l_ldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in large LDL (%)
220	l_ldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in large LDL (%)
221	l_ldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in large LDL (%)
222	m_ldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in medium LDL (%)
223	m_ldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in medium LDL (%)

224	m_ldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in medium LDL (%)
225	m_ldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in medium LDL (%)
226	m_ldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in medium LDL (%)
227	s_ldl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in small LDL (%)
228	s_ldl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in small LDL (%)
229	s_ldl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in small LDL (%)
230	s_ldl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in small LDL (%)
231	s_ldl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in small LDL (%)
232	xl_hdl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in very large HDL (%)
233	xl_hdl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in very large HDL (%)
234	xl_hdl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in very large HDL (%)
235	xl_hdl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in very large HDL (%)
236	xl_hdl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in very large HDL (%)
237	l_hdl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in large HDL (%)
238	l_hdl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in large HDL (%)
239	l_hdl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in large HDL (%)
240	l_hdl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in large HDL (%)
241	l_hdl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in large HDL (%)
242	m_hdl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in medium HDL (%)
243	m_hdl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in medium HDL (%)
244	m_hdl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in medium HDL (%)
245	m_hdl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in medium HDL (%)

246	m_hdl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in medium HDL (%)
247	s_hdl_pl_pct	Relative lipoprotein lipid concentrations: Phospholipids to total lipids ratio in small HDL (%)
248	s_hdl_c_pct	Relative lipoprotein lipid concentrations: Cholesterol to total lipids ratio in small HDL (%)
249	s_hdl_ce_pct	Relative lipoprotein lipid concentrations: Cholesteryl esters to total lipids ratio in small HDL (%)
250	s_hdl_fc_pct	Relative lipoprotein lipid concentrations: Free cholesterol to total lipids ratio in small HDL (%)
251	s_hdl_tg_pct	Relative lipoprotein lipid concentrations: Triglycerides to total lipids ratio in small HDL (%)
252	edta_plasma	QC tags: EDTA plasma
253	citrate_plasma	QC tags: Citrate plasma
254	low_ethanol	QC tags: Low ethanol
255	medium_ethanol	QC tags: Medium ethanol
256	high_ethanol	QC tags: High ethanol
257	isopropyl_alcohol	QC tags: Isopropyl alcohol
258	n_methyl_2_pyrrolidone	QC tags: 1-methyl-2-pyrrolidone
259	polysaccharides	QC tags: Polysaccharides
260	aminocaproic_acid	QC tags: Aminocaproic acid
261	low_glucose	QC tags: Low glucose
262	high_lactate	QC tags: High lactate
263	high_pyruvate	QC tags: High pyruvate
264	low_glutamine_or_high_glutamate	QC tags: Low glutamine / high glutamate
265	gluconolactone	QC tags: Gluconolactone
266	low_protein	QC tags: Low protein
267	unexpected_amino_acid_signals	QC tags: Unexpected amino acid signals
268	unidentified_macromolecules	QC tags: Unidentified macromolecules
269	unidentified_small_molecule_a	QC tags: Unidentified small molecule (a)
270	unidentified_small_molecule_b	QC tags: Unidentified small molecule (b)
271	unidentified_small_molecule_c	QC tags: Unidentified small molecule (c)
272	below_limit_of_quantification	QC tags: Below limit of quantification

