**S3 Fig.** Two-stage IPD meta-analysis and individual cohort associations: offspring lipoprotein, lipids and metabolite differences per 1-SD higher maternal (pink) or paternal (blue) BMI.

### Lipoprotein subclasses

*Extremely large VLDL*

- Particle concentration
- Total lipids
- Phospholipids
- Total cholesterol
- Cholesterol esters
- Free cholesterol
- Triglycerides

*Very large VLDL*

- Particle concentration
- Total lipids
- Phospholipids
- Total cholesterol
- Cholesterol esters
- Free cholesterol
- Triglycerides

SD difference in offspring metabolite concentration (95% CI) per 1-SD of parental BMI increment:

<table>
<thead>
<tr>
<th>ALSPAC</th>
<th>NFBC96</th>
<th>NFBC98</th>
<th>Two-stage IPD</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P &lt; 0.003 Mother Father</em></td>
<td><em>P &lt; 0.003 Mother Father</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P < 0.003 for parental difference
**Lipoprotein subclasses**

*Large VLDL*

- Particle concentration
- Total lipids
- Phospholipids
- Total cholesterol
- Cholesterol esters
- Free cholesterol
- Triglycerides

*Medium VLDL*

- Particle concentration
- Total lipids
- Phospholipids
- Total cholesterol
- Cholesterol esters
- Free cholesterol
- Triglycerides

SD difference in offspring metabolite concentration (95% CI) per 1-SD of parental BMI increment

- ALSPAC
- NFBC86
- NPBC66
- Two-stage IPD

* P < 0.003 for parental difference
S3 Fig continued.

Lipoprotein subclasses

Small VLDL

<table>
<thead>
<tr>
<th></th>
<th>Particle concentration</th>
<th>Total lipids</th>
<th>Phospholipids</th>
<th>Total cholesterol</th>
<th>Cholesterol esters</th>
<th>Free cholesterol</th>
<th>Triglycerides</th>
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Very Small VLDL

<table>
<thead>
<tr>
<th></th>
<th>Particle concentration</th>
<th>Total lipids</th>
<th>Phospholipids</th>
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SD difference in offspring metabolite concentration (95%CI) per 1-SD of parental BMI increment

* P < 0.003 for parental difference

ALSPAC
NFBC86
NPBC66
Two-stage IPD

P ≥ 0.003
P < 0.003
Mother
Father
S3 Fig continued.

**Lipoprotein subclasses**

*IDL*

- Particle concentration
- Total lipids
- Phospholipids
- Total cholesterol
- Cholesterol esters
- Free cholesterol
- Triglycerides

*Large LDL*

- Particle concentration
- Total lipids
- Phospholipids
- Total cholesterol
- Cholesterol esters
- Free cholesterol
- Triglycerides

**SD difference in offspring metabolite concentration (95%CI) per 1-SD of parental BMI increment**

ALSPAC  
NFBC66  
NFBC68  
Two-stage IPD

* P ≥ 0.003  
$\bullet$ P < 0.003 for parental difference
S3 Fig continued.

Lipoprotein subclasses

Medium LDL

<table>
<thead>
<tr>
<th>Metabolite</th>
<th>Particle concentration</th>
<th>Total lipids</th>
<th>Phospholipids</th>
<th>Total cholesterol</th>
<th>Cholesterol esters</th>
<th>Free cholesterol</th>
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Small LDL

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<th>Metabolite</th>
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SD difference in offspring metabolite concentration (95%CI) per 1 SD of parental BMI increment

ALS PAC
NFBC86
NFBC06
Two-stage IPD

* P < 0.003 for parental difference
### Lipoprotein subclasses

**Very large HDL**

<table>
<thead>
<tr>
<th>Metabolite</th>
<th>Particle concentration</th>
<th>Total lipids</th>
<th>Phospholipids</th>
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**Large HDL**

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</table>

SD difference in offspring metabolite concentration (95%CI) per 1-SD of parental BMI increment

ALSPAC: P < 0.003  
NFBC86: Mother Father  
NFBC96: Mother Father  
Two-stage IPD:  

* P < 0.003 for parental difference
S3 Fig continued.

Lipoprotein subclasses

Medium HDL

<table>
<thead>
<tr>
<th></th>
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<th>Total lipids</th>
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Small HDL

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SD difference in offspring metabolite concentration (95%CI) per 1-SD of parental BMI increment

ALSPAC
NFBC86
NPBC96
Two-stage IPD

P ≥ 0.003
Mother Father
P < 0.003
Mother Father

★ P < 0.003 for parental difference
S3 Fig continued.

**Cholesterol**

- Total C
- VLDL C
- Remnant C
- LDL C
- HDL C
- HDL₂ C
- HDL₃ C
- Esterified C
- Free C

**Glycerides and phospholipids**

- Triglycerides
- VLDL triglycerides
- LDL triglycerides
- HDL triglycerides
- Phosphoglycerides
- Phosphatidylcholine + other cholines
- Cholines

SD difference in offspring metabolite concentration (95%CI) per 1–SD of parental BMI increment

- ALSPAC
- NFBC86
- NFBC66
- Two-stage IPD

* P < 0.003 for parental difference

P ≥ 0.003
Mother Father
P < 0.003
Mother Father

8/11
**S3 Fig continued.**

**Fatty acids**

<table>
<thead>
<tr>
<th></th>
<th>ALSPAC</th>
<th>NFBC96</th>
</tr>
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<tbody>
<tr>
<td><strong>Total fatty acids</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Degree of unsaturation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Docosahexaenoic acid</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Linoleic acid</strong></td>
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<td></td>
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<tr>
<td><strong>n-3 fatty acids</strong></td>
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<td></td>
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<tr>
<td><strong>n-6 fatty acids</strong></td>
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<tr>
<td><strong>PUFA</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>MUFA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Saturated fatty acids</strong></td>
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**Fatty acids ratios**

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<td><strong>Saturated fatty acids (%)</strong></td>
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**SD difference in offspring metabolite concentration (95%CI) per 1-SD of parental BMI increment**

ALSPAC  
NFBC96  
Two-stage IPD  

* P < 0.003 for parental difference
S3 Fig continued.

Lipoprotein particle size

- VLDL particles size
- LDL particles size
- HDL particles size

Apolipoproteins

- Apolipoprotein A-I
- Apolipoprotein B

Glycolysis related metabolites

- Glucose
- Lactate
- Pyruvate
- Citrate

SD difference in offspring metabolite concentration (95%CI) per 1-SD of parental BMI increment

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</table>

* P < 0.003 for parental difference
Associations were adjusted for parental age, smoking status, education, head of household social class, maternal parity, offspring’s age at blood collection and sex. Results are shown in SD-scaled concentration units of outcome, changes in absolute concentration units are listed in S4-S6 Tables. Error bars = 95% confidence intervals (CI). VLDL=very-low-density lipoprotein; IDL=intermediate-density lipoprotein; LDL=low-density lipoprotein; HDL=high-density lipoprotein; C= cholesterol; MUFA=monounsaturated fatty acids; PUFA=polyunsaturated fatty acids.