

Cross-sectional metabolic profiles of mental health in population-based cohorts of 11-12 year olds and mid-life adults: the Longitudinal Study of Australian Children

Short title: Metabolic profiles of mental health

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ABSTRACT

Objective: Poorer mental health in adulthood is associated with increased risk of cardiovascular disease (CVD) and reduced life expectancy. However, little is known of the molecular pathways underpinning this relationship and how early in life adverse metabolite profiles relate to self-reported variation in mental health. We examined cross-sectional associations between mental health and serum metabolites indicative of cardiovascular health, in large Australian population-based cohorts at two stages of the life-course.

Methods: We characterised cross-sectional serum nuclear magnetic resonance metabolite profiles of positively- and negatively-framed mental health in a large population-based sample of Australian 11-12 year olds (n=1172; 51% girls) and mid-life adults (n=1322; mean age 45 years; 87% women). We examined multiple standard self-report mental health scales, spanning psychosocial health, general well-being, life satisfaction, and health-related quality of life. Linear regression was used to investigate the cross-sectional association between mental health and each metabolite (n=73) in children and adults separately, unadjusted and adjusted for age, sex, socioeconomic position and body mass index (BMI).

Results: Better child and adult mental health were associated with lower levels of the inflammatory marker GlycA, and a favourable, less atherogenic lipid/lipoprotein profile. Patterns of association in children were generally weaker than in adults. Associations were generally modest and partially attenuated when adjusted for BMI.

Conclusions: In general, metabolite profiles associated with better child and adult mental health closely aligned with those predictive of better cardiovascular health in adults. Our findings support previous evidence for the likely bidirectional relationship between mental health and CVD risk, by extending this evidence base to the molecular level and in children.

Abbreviations

ApoA1	Apolipoprotein A1
ApoB	Apolipoprotein B
AQoL8D-PS	Assessment of Quality of Life scale (8-Dimensions): Psychosocial sub-scale
BMI	Body mass index
CheckPoint	Child Health CheckPoint
CHU9D	Child Health Utility scale (9-Dimensions)
CI	Confidence interval
CVD	Cardiovascular disease
FAs	Fatty acids
GlycA	Glycoprotein acetyls
HDL	High density lipoprotein
HRQoL	Health-related quality of life
IDL	Intermediate density lipoprotein
ISCWeb	International Survey of Children's Well-being scale
LDL	Low density lipoprotein
LSAC	Longitudinal Study of Australian Children
NMR	Nuclear magnetic resonance
PedsQL-PS	Paediatric Quality of Life scale 4.0: Psychosocial sub-scale
PedsQL-GW	Paediatric Quality of Life scale 4.0: General well-being sub-scale
REDCap	Research Electronic Data Capture tool
SD	Standard deviation
SEP	Socioeconomic position
VLDL	Very low density lipoprotein
QoL	Quality of life

INTRODUCTION

Poorer mental health in adulthood is associated with increased risk of cardiovascular disease (CVD) (Scott et al., 2016) and reduced life expectancy (Diener et al., 2017). However, little is known of the molecular pathways underpinning this relationship, its directionality, any mediating effects of social and environmental factors, and how early in life adverse metabolite profiles are associated with variation in mental health. Approximately half of mental disorders have their onset during adolescence (Jones, 2018), and for some mental disorders, such as anxiety, the median onset is younger still (Essau et al., 2018). To address the growing burden of mental illness, we need to address the wider mental health spectrum during key developmental windows and understand molecular mediators of the relationship with key co-morbidities, such as CVD, which may identify potential intervention points for multiple conditions. The first step towards understanding if these pathways may be causal is to establish whether or not cross-sectional relationships exist, and if so in what age groups.

Previous data suggest the relationship between mental health and CVD is partially mediated via chronic inflammation (Haapakoski et al., 2015). In addition, people with mental illnesses have been shown to have a unique biomarker profile. For example, in a large meta-analysis of 9 Dutch cohorts, adults with depression were compared with those without depression and found to have less optimal metabolic profiles (Bot et al., 2020). Specific observed differences for adults with versus without depression included: lower plasma apolipoprotein A1 (ApoA1), HDL cholesterol and acetate; smaller HDL diameter; higher VLDL cholesterol, apolipoprotein B (ApoB), glycerides, phospholipids, triglycerides, total and monounsaturated fatty acids (FAs), glycoprotein acetyls (glycA), tyrosine and isoleucine; and larger VLDL diameter and fatty acid chain length. Similar associations are also seen in other mental

illnesses, such as schizophrenia and bipolar disorder (Quintero et al., 2019). Some blood biomarkers associated with mental illnesses are potentially relevant to CVD (Würtz et al., 2012), but studies examining mental health-related molecular profiles in population-based cohorts are sparse. Growing evidence in adults suggests an interaction between depression and metabolic syndrome (McIntyre et al., 2009), an early indicator for CVD risk at a molecular level (Han and Lean, 2016). It is unclear whether similar associations exist earlier in the life-course, or across the full mental health spectrum, from positive mental health and sub-clinical mental health problems, to overt mental illnesses such as depression, schizophrenia and bipolar disorder.

We examined cross-sectional associations between mental health and serum metabolites in a large Australian population-based cohort at two life stages, 11-12 year olds and mid-life adults (parents of the children). We included measures of negatively-framed and positively-framed mental health, to span its full spectrum at different ages. We included serum metabolites with known CVD associations, as we were interested in whether patterns similar to those underlying CVD might emerge for mental health. This knowledge could potentially elucidate shared pathogenesis for mental illness and CVD. However, this analysis is exploratory; it simply seeks to establish whether metabolites known to be associated with CVD also share a relationship with mental health. It neither assumes a unidirectional path between mental health and cardiovascular health, nor precludes relationships with other physical diseases.

METHODS

Study population

Data are drawn from the Longitudinal Study of Australian Children (LSAC)'s bio-physical module, the Child Health CheckPoint (CheckPoint). LSAC utilised a two-stage clustered random sampling design based on postcode (Soloff et al., 2005), to obtain a sample relatively representative of the Australian population. LSAC's birth-cohort recruited 5107 0-1 year-olds in 2004, with follow-up every two years (retention rate 74% in wave 6, 2014) (Edwards, 2014). CheckPoint comprised a once only physical health and biomarkers assessment nested between LSAC's 6th and 7th waves, from February 2015 to March 2016, for 1874 birth-cohort children and one on their parents (Clifford et al., 2019). Most families attended a 'pop-up' Assessment Centre in central locations across Australia, where families rotated through stations measuring specific health attributes. Families unable to attend an Assessment Centre were offered a home visit, but were not included in these analyses as venous blood samples were not collected at home visits. Of the 3764 families eligible for CheckPoint, 1874 families (50%) took part, of whom 1172 children and 1322 adults with metabolomic data and at least one mental health measure were included in our analyses (FigureS1).

The study protocol was approved by The Royal Children's Hospital Melbourne Human Research Ethics Committee (33225D) and Australian Institute of Family Studies Ethics Committee (14-26). The attending parent or guardian provided written informed consent for them and their child to participate in the study.

Measures

TableS1 provides details of validated instruments used to collect mental health, venous blood and covariates, which are summarised below.

Mental health

Participants self-reported mental health on iPad-based questionnaires. Children completed two negatively-framed measures, capturing psychosocial health (Paediatric Quality of Life 4.0: Psychosocial sub-scale, PedsQL-PS (Varni et al., 2001)) and overall health-related quality of life (HRQoL; Child Health Utility 9-Dimensions, CHU9D (Stevens, 2011)), and two positively-framed measures, capturing general well-being (Paediatric Quality of Life 4.0: General Well-being Scale, PedsQL-GW (Varni et al., 2001)) and life satisfaction (International Survey of Children's Well-being Brief Multidimensional Students' Life Satisfaction Scale, ISCWeb (Seligson et al., 2003)).

Adults completed one negatively-framed measure capturing HRQoL (CHU9D (Stevens, 2011) adapted for adults), and an overall measure of positive and negative psychosocial quality of life (QoL; Assessment of Quality of Life 8-Dimensions: Psychosocial sub-scale, AQoL8D-PS (Richardson et al., 2014)). To assess the impact of item framing in adults, we additionally conducted analyses using two reduced versions of the AQoL8D-PS, comprising unweighted scores of the positively-framed (happiness, coping skills, self-worth and relationships) and negatively-framed (mental health, self-worth and relationships) items separately. However, as associations were very similar for these scores compared to the overall AQoL8D-PS, only the validated AQoL8D-PS results are presented. All mental health cumulative scores are scaled to a 0-1 or 0-100 scale, such that a higher score indicates better mental health.

Metabolic measures

Metabolites were analysed in serum from semi-fasted venous blood samples (children 50 minutes to 20 hours, median 4.1 hours; adults 30 minutes to 22.6 hours, median 2.9 hours). Blood samples were collected by a single venepuncture from the non-dominant arm of semi-reclining participants, processed on-site into 6 serum aliquots generally within an hour (median 53 minutes), and stored at -80°C. Samples were shipped on dry ice to the long-term storage facility, and one aliquot per participant shipped on dry ice to Nightingale® Health (Helsinki, Finland). Metabolite profiles were measured by nuclear magnetic resonance (NMR) spectroscopy on the Nightingale® metabolomics platform. Data described here were derived using the facility's 2016-version quantification algorithm. Details of this platform have been described elsewhere (Soininen et al., 2009), including distributions in CheckPoint participants (Ellul et al., 2019). Briefly, NMR-based high-throughput quantification measured the absolute concentration and ratios of 228 metabolites simultaneously from a single 0.35mL serum aliquot. This included standard lipids, lipoprotein subclass distributions, particle size and composition, fatty acids (FAs), and other low molecular weight metabolites, such as amino acids and glycolysis-related metabolites.

We have previously established that many metabolites correlate substantially within adults and children (Ellul et al., 2019). Thus we focused on an informative subset of 73 metabolites that capture the majority of variation within the dataset (TableS2). These can be grouped as: 1) lipids, cholesterol and triglycerides, 2) FAs and cholines, and 3) other metabolites (including apolipoproteins, amino acids, ketone and glycolysis factors, fluid balance and inflammation markers). For different size lipoprotein particles, figures only show the most representative of similar associations to reduce repetition, including VLDL lipids (large), LDL lipids (medium), HDL lipids (medium), and HDL cholesterol (HDL1 cholesterol).

Related measures

Our analyses accounted for age, sex, socioeconomic position (SEP), BMI, puberty and pre-existing mental health conditions, since these could affect associations between mental health and metabolite profiles. Certain metabolites measured on the NMR platform show clear sex differences (e.g. higher leucine and valine in males and higher LDL particle diameter in females), and more variation in profiles and larger sex differences with increasing age (Ellul et al., 2019). Date of birth and sex were obtained from Medicare records for children and self-reported for adults. In addition, socioeconomic gradients have been documented in mental health (Stewart-Brown et al., 2018) and metabolic profiles (Slopen et al., 2013). SEP was obtained from LSAC's wave 6 data (preceding CheckPoint, at child age 10-11), incorporating parent-reported education, income and occupation at wave 6, and internally standardized (mean 0, standard deviation (SD) 1) (Blakemore et al., 2009). BMI (kg/m²) was included in some analyses as the relationship between BMI, mental health and serum metabolites is unclear (Luppino et al., 2010). We corrected for known variation in BMI across age and sex in children by using the Centers for Disease Prevention and Control z-score (Ogden et al., 2002). We assessed pubertal status in children using CheckPoint's 5-item self-report Pubertal Development Scale (Petersen et al., 1988), as pubertal timing can affect mental health (Oldehinkel et al., 2011). Pre-existing mental health and related conditions were drawn from LSAC's waves 1-6 data collected over the 10 years prior. Adults self-reported in alternating waves if they had ever experienced a mental condition (including depression, schizophrenia, bipolar disorder, or other mental illness excluding post-natal depression). For children, parents proxy-reported each wave if their child had an ongoing mental condition (including anxiety, depression, attention deficit hyperactivity disorder and autism spectrum disorder) (Edwards, 2014).

Statistical analyses

Unadjusted and adjusted linear regression models were used to examine associations between mental health and serum metabolites for complete cases, in children and adults separately.

We used a Student's t-test to confirm there was little evidence of a difference between complete cases and those with missing data across mental health measures, age, sex and BMI.

However, complete cases had a higher socioeconomic position than those missing data (see limitations). Scatterplots of metabolites and mental health measures were examined to check for outliers and to ensure assumptions for linear regression models were met. No outliers

were identified beyond the expected variation within a population-based cohort. Results are presented in figures using internally standardised variables (mean 0, SD 1), with mental

health as the independent variable. However, results on the original scale and considering both model directions are available in TableS4 and TableS8. We assessed additional models

including (i) age, sex, and SEP as covariates, and (ii) age, sex, SEP and BMI as covariates.

Given the similarity of results from unadjusted and model (i), we present only unadjusted and model (ii) results in figures and tables. We conducted additional secondary analyses with

model (i) also adjusted for puberty in children, stratified model (ii) by sex to examine any potential sex differences, and excluded those with a diagnosed mental health condition to

examine the sensitivity of findings to the effects of clinically significant mental illness. Given the descriptive aims of the paper, we report all standardised estimates with associated 95%

confidence intervals (CI) and focus on the pattern of associations, rather than p-values or

specific results in isolation. Although some metabolites demonstrated skewed distributions, log-transformation did not significantly alter the patterns of association, so we have reported

results without log transformation for ease of interpretability. Statistical analyses were

conducted using Stata v14.2.

RESULTS

Sample characteristics

Table 1 describes sample characteristics. Children (mean age 12.0 (SD 0.4) years) included similar numbers of boys and girls, but most adults (mean age 44.5 (SD 5.2) years) were female (87%). BMI was in line with national Australian averages, with mean child BMI z-score 0.3 and mean adult BMI 27.8 kg/m². Ever experiencing a mental health or related condition was parent-reported in 10% of children (equally anxiety and cognitive conditions), and self-reported in 66% of adults (predominantly depression). The SEP of participants included in our analyses was about a quarter of a standard deviation above, and had a smaller variance than, the main LSAC Birth-cohort at wave 1 (Blakemore et al., 2009).

Associations with metabolite groups

Lipids, cholesterol and triglycerides

Within lipids, cholesterol and triglycerides, better mental health in children and adults was most strongly associated with lower VLDL components (VLDL lipids, cholesterol and triglycerides, and lower mean diameter) and lower triglycerides (total, VLDL and HDL triglycerides) (Figure 1, with numeric values in Table S3). For example, in the fully adjusted model, 1SD unit higher life satisfaction for children and psychosocial QoL for adults was associated with -0.12SD units (95% CI -0.17, -0.06) and -0.07SD units (-0.11, -0.02) VLDL lipids, respectively. Better mental health was also associated with higher HDL (lipids and cholesterol, and higher mean diameter) in children and adults, and lower LDL and IDL triglycerides and higher mean LDL diameter in adults only. Associations with mental health were less pronounced for non-HDL cholesterol, phosphoglycerides, and LDL and IDL lipids.

FAs and cholines

Within FAs and cholines, better mental health in children and adults was most strongly associated with lower total, saturated and monounsaturated FAs, and higher polyunsaturated FAs and degree of fatty acid unsaturation, up to 0.11SD units (95%CI 0.04,0.15) for child life satisfaction and up to 0.10SD units (0.02,0.13) for adult HRQoL utility (Figure2, with numeric values in TableS3). Better mental health in children and adults was also associated with higher ratios of omega 3 FAs (primarily 22:6, docosahexaenoic acid) and omega 6 FAs (including 18:2 linoleic acid) relative to total FAs, but associations were less pronounced for the absolute serum levels of these FAs. Less prominent associations with better mental health were seen for higher sphingomyelins and lower cholines (including phosphatidylcholine) in children and adults.

Other metabolites

Better mental health in children and adults was associated with higher apolipoprotein A1 (ApoA1), albumin and creatinine, and with lower GlycA, apolipoprotein B (ApoB), and pyruvate, around -0.08SD units for children and -0.06SD units for adults per SD unit higher mental health in the fully adjusted model (Figure3, with numeric values in TableS3). In children, better mental health was associated with lower glutamine, aliphatic (alanine, glycine, isoleucine and leucine) and aromatic amino acids (phenylalanine and tyrosine) (-0.08 to -0.10SD units), while associations for valine and glycerol were inconsistent between child mental health measures. Associations were less pronounced for amino acids and glycerol in adults. Better mental health was associated with higher citrate and ketone body metabolites (acetate, acetoacetate and 3-hydroxybuturate) in children, but lower levels in adults.

General patterns

Patterns of associations were highly consistent across mental health measures in children and adults. The exception was children's HRQoL utility, which demonstrated a less pronounced pattern of metabolite associations compared with other measures. Similar patterns of association were seen for positively- and negatively-framed measures in children and adults, although associations were generally more pronounced for positively-framed scales in children. Results were similar when adjusted for age, sex, SEP and puberty (for children; TableS5). For some scales, associations for VLDL and HDL diameter, HDL lipids, HDL cholesterol, ratio of Omega 3 to total FAs, sphingomyelins, ApoA1 and albumin were slightly attenuated towards to null, while associations for total and saturated FAs were slightly more substantial, when additionally adjusted for puberty (additionally to age, sex and SEP) in children. However, addition of BMI to the adjustment set slightly to moderately attenuated most results towards the null (adjusted models in Figures1-3 and TableS3). Associations were similar but generally less pronounced when excluding participants reporting ever experienced any mental health condition (TableS6). The largest difference between those with and without ever experiencing any mental health condition were seen for HDL diameter, HDL cholesterol, degree of unsaturation, Omega 3 FAs, ApoA1, ApoB, glycerol, alanine, histidine, tyrosine and glyca in adults, while no substantial changes were seen in children with the smaller number of excluded children with mental health conditions. Associations were less robust (larger confidence intervals) when stratified by sex, especially for the small number of men (TableS7). Some minor differences were seen between boys and girls, with higher mental health scores associated with lower acetate, glutamine, albumin and phenylalanine in boys, and higher histidine and lower glycerol in girls. In adults, metabolic profiles for women mirrored those for all adults (reflecting the large proportion of mothers in our sample), while higher mental health in men was associated with higher cholesterol, triglycerides, LDL and IDL lipids, cholines, tyrosine and albumin, and lower citrate, alanine, isoleucine, leucine,

glutamine, histidine and creatinine. Patterns of association were similar when the direction of the model was reversed (TableS8).

DISCUSSION

Principal findings

The metabolite profiles associated with better mental health in children and adults aligned with those previously associated with better cardiovascular health (Russo, 2009; Ritchie et al., 2015), consistent with previous evidence for substantial co-morbidity of mental illnesses and CVD in adults (Cohen et al., 2015). A 'better mental health' profile showed lower levels of the inflammatory marker GlycA, the glycolysis factor pyruvate, and a favourable lipid profile (including lower VLDL, triglycerides, ApoB, and saturated and monounsaturated FAs, and higher HDL, omega 3, omega 6, and polyunsaturated FAs). Better mental health in children was associated with lower levels of aromatic (phenylalanine and tyrosine) and aliphatic amino acids (alanine, glycine, isoleucine and leucine), previously linked to increased risk of CVD (Magnusson et al., 2013) and type 2 diabetes (Würtz et al., 2013).

Consistency of findings

Patterns of associations were consistent across positive and negative mental health measures, in adults and children, supporting robustness of the metabolic profiles across the mental health spectrum. Associations for children were more pronounced in positively-framed than negatively-framed measures. This may relate to the length of recall time or breadth of the measures used. Additionally, associations between mental health and metabolites were generally more pronounced and consistent in adults than children. This may relate to cumulative exposures over time and known associations between metabolites and overt disease, or potentially differences in emotional expression with age.

The addition of BMI generally attenuated results, although less so in adults. Combined with modest associations, this suggests potential confounding or mediation by BMI, or a more complex relationship between mental health, metabolism, obesity and cardiovascular risk. As the relationship between BMI and mental health may be bi-directional (Luppino et al., 2010), the additional model with BMI as a covariate is included with caution. Longitudinal analyses are warranted to establish the role of BMI in the causal pathway, and any opportunity to inform optimal targets and timing for prevention efforts. As our aim was to establish patterns of association rather than pursue causality, we did not examine the potential for residual confounding here. As such, we have also not included other potential confounders in the relationship between mental health and CVD, such as medications, smoking and physical activity, as this type of investigation of causality was beyond the focus of this study.

Findings in light of previous research

Our results for triglycerides and HDL cholesterol were consistent with previous results from an elderly Taiwanese population-based cohort (Seplaki et al., 2004), with slightly smaller associations in our mid-life adults. Our results in a population-based study of children and adults were also consistent with many previous studies in adults with depression. This included better mental health associated with lower VLDL cholesterol and diameter, ApoB, triglycerides, total and monounsaturated FAs, and glycA, and higher linoleic acid, ApoA1, HDL cholesterol and diameter, and omega-3 FAs (Ditzen et al., 2011; Ding et al., 2014; Lu et al., 2014; Mischoulon and Fava, 2000; Bot et al., 2020). The positive association of mental health with acetate, and the negative association of mental health with tyrosine, glycine, alanine and isoleucine, in children has been previously associated with symptoms of depression and anxiety in some adults (Altmaier et al., 2013; Ding et al., 2014; Bot et al., 2020).

Our results, and those in a recent study of depressed adults (Bot et al., 2020), for GlycA support evidence of inflammation mediating the relationship between mental health and CVD (Haapakoski et al., 2015). Similarly, the less atherogenic lipid/lipoprotein profile supports potential mediation by metabolic syndrome (McIntyre et al., 2009). Genome-wide association studies have identified an enrichment of inflammatory (Kao et al., 2012) and metabolism (Hebebrand et al., 2018) genetic variants associated with mental health related phenotypes. As many mental health traits are moderately heritable (Bartels, 2015), this may indicate potential complex gene-environment interactions underlying our associations. However, higher monounsaturated FAs may have protective effects in some contexts, such as diabetes, metabolic syndrome and CVD (Maedler et al., 2003; Ros, 2003; Gillingham et al., 2011). The negative relationship seen with mental health here and previously in depressed adults (Bot et al., 2020) may suggest nuances in the relationship of monounsaturated FAs with mental and physical health.

Given our data are cross-sectional, we do not imply directionality of the associations observed. Associations between better mental health and a cardio-protective metabolic profile could arise from a number of factors, such as the bi-directional relationship between mental health and dietary intake (Arvidsson et al., 2017), the influence of social patterning on mental health (Huurre et al., 2003) and dietary intake (Gasser et al., 2017), or shared genetic determinants (Mulle and Vaccarino, 2013). Similarly, analogous molecular profiles could have arisen from a common biological vulnerability or similar physical consequences rather than a direct causal pathway between mental health and CVD. Thus, longitudinal analyses are necessary to establish the sequence of events between mental health and changes in cardio-

protective metabolic factors (directionality). Such studies could also help establish whether analogous metabolite associations suggest any common causal pathways or common consequences between mental health and CVD that could inform future intervention efforts.

Strengths and limitations

Our study builds on previous research by examining the mental health spectrum in population-based cohorts at two life stages. The LSAC study represents a carefully designed population-based cohort, but participation in CheckPoint assessment centres was influenced by regional remoteness, single parent status, extracurricular activities, after-school care, parental education, SEP, and support service use (Ellul et al., 2018). The SEP of participants included in our analyses were also about a quarter of a standard deviation above participants missing serum metabolite data, due to SEP differences between those with and without blood samples collected. Our sample are therefore not representative of more disadvantaged families in Australia, but within population associations are likely to be preserved.

The benefit of our parent-child design is that it eliminates many sources of heterogeneity seen in other cross-cohort studies. However, this also brings small correlations in metabolites for parent-child pairs as previously published (Ellul et al., 2019), likely from both genetic and shared environmental influences. Parent-child correlations may slightly exacerbate the level of similarity between adult and child metabolic profiles of mental health. However, this does not invalidate our aim to show if, by what age group, and how strongly, patterns between mental health and metabolites emerge at the population level. The adult population are also predominantly mothers. Although the stratified sample sizes for male adults were too small to draw any robust conclusions, for completeness we include the stratified results. Additionally, the NMR platform is a reproducible, widely-used platform, but is largely focused on

metabolites associated with cardiometabolic risk. A more detailed metabolomics and biomarker profile, incorporating other approaches (such as hormones, lipidomics, and proteomics) is needed to more fully explore the molecular underpinnings of mental health.

Our findings are interpreted in light of previous studies in mental disorders (predominantly depression) with caution. Our epidemiological measures span the mental health spectrum, with most individuals in the 'normal' range for each measure. Such measures do not parallel diagnostic categories, but are in line with the emerging notion of an overarching spectrum of psychopathology (Caspi and Moffitt, 2018). This would suggest that, if causally related, similar metabolite patterns could underlie multiple mental disorders as well as physical health conditions such as CVD.

CONCLUSION

We identified cross-sectional metabolic profiles of mental health in children and their parents, which are largely similar to those previously associated with cardiovascular health. This alignment of molecular profiles strengthens previous evidence for a relationship between mental health and CVD, by expanding this evidence base to the blood metabolite level. The next step would be longitudinal analyses to establish the directionality of this relationship, and whether these metabolites indicate common causal pathways or common consequences. If evidence suggests a causal direction, the metabolites highlighted here may suggest novel intervention points through which to address the higher incidence of CVD and increased mortality risk of mental health conditions.

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Declaration of Conflicting Interests

None declared.

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Data Sharing

Dataset and technical documents available from The Longitudinal Study of Australian

Children for bona fide researchers (www.growingupinaustralia.gov.au).

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Table1. Sample characteristics. Details for blood metabolites used in this study are shown in TableS2.

CheckPoint characteristics	<i>Mean (SD) or N (%)</i>	
	Children	Adults
Age (years)	12.0 (0.4)	44.5 (5.2)
Female (N,%)	601 (51.2)	1145 (86.6)
BMI, (kg/m ²)	19.2 (3.3)	27.8 (6.1)
BMI z-score	0.3 (1.0)	n/a
Puberty (N,%)		
Early-mid	844 (77.2)	n/a
Late-post	145 (13.3)	n/a
Mental health measures		
HRQoL (0-1)	0.821 (0.148)	0.895 (0.093)
Psychosocial health (0-100)	77.0 (14.0)	n/a
General well-being (0-100)	82.9 (13.3)	n/a
Life satisfaction (0-100)	83.3 (13.7)	n/a
Psychosocial QoL (0-1)	n/a	0.469 (0.165)
LSAC characteristics		
Socioeconomic position (SEP) [§]	0.3 (0.9)	0.3 (1.0)
Reported mental health condition (N,%) [%]	123 (10.5)	876 (66.3)
Depression or anxiety disorder	73 (6.2)	786 (59.5)
Schizophrenia or bipolar disorder	n/a	12 (0.9)
Attention Deficit Hyperactivity Disorder or Autism Spectrum Disorder	62 (5.3)	n/a

[§]SEP was drawn from LSAC Wave 6 assessments, conducted approximately one year prior to CheckPoint;

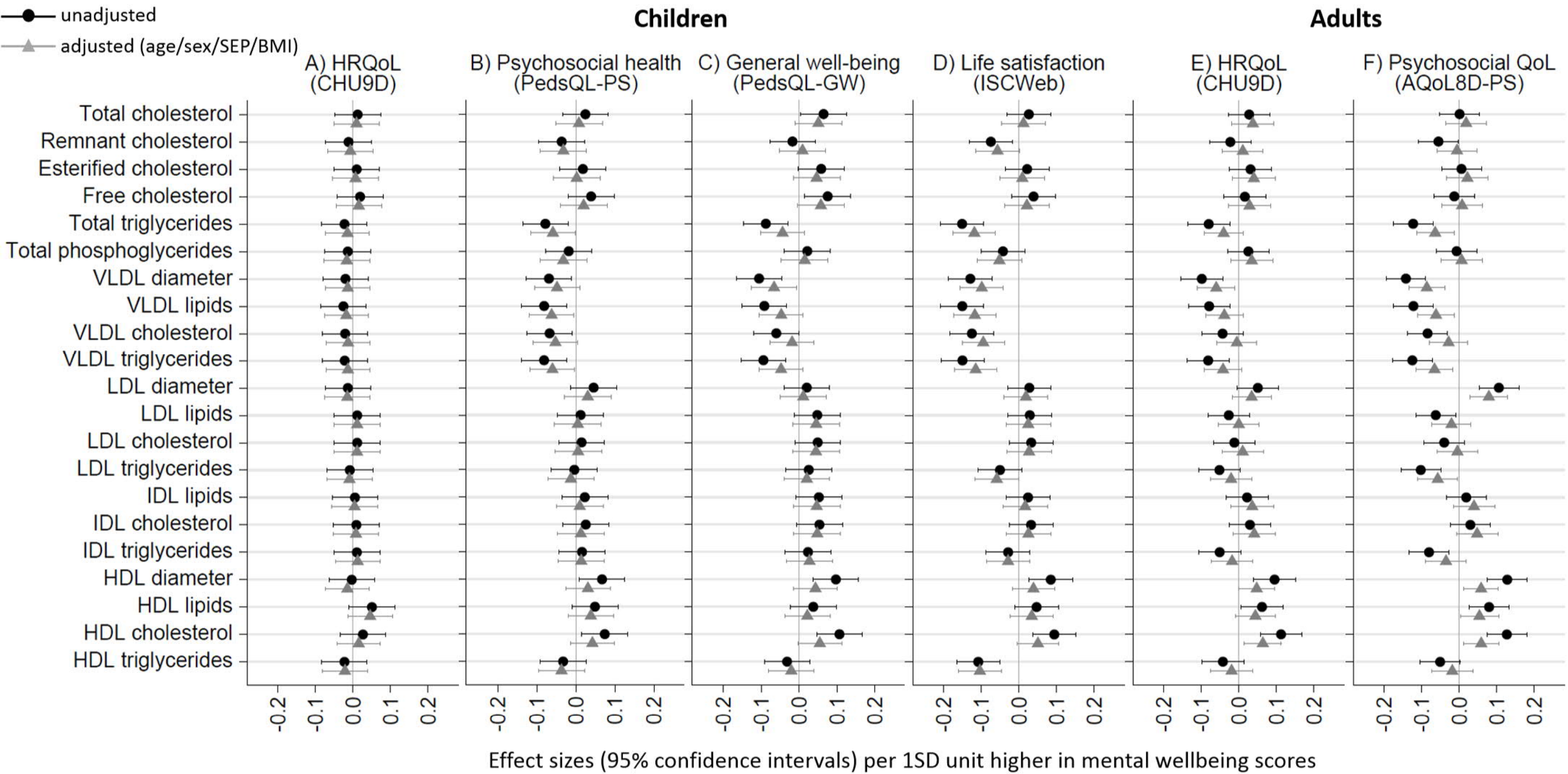
[%]mental health conditions "ever experienced" were drawn from LSAC waves 1-6 over the previous 10 years.

Figure captions

Figure1. Associations of mental health with lipid, cholesterol and triglyceride profiles in children (A-D) and adults (E-F).

Figure2. Associations of mental health with fatty acid and choline profiles in children (A-D) and adults (E-F).

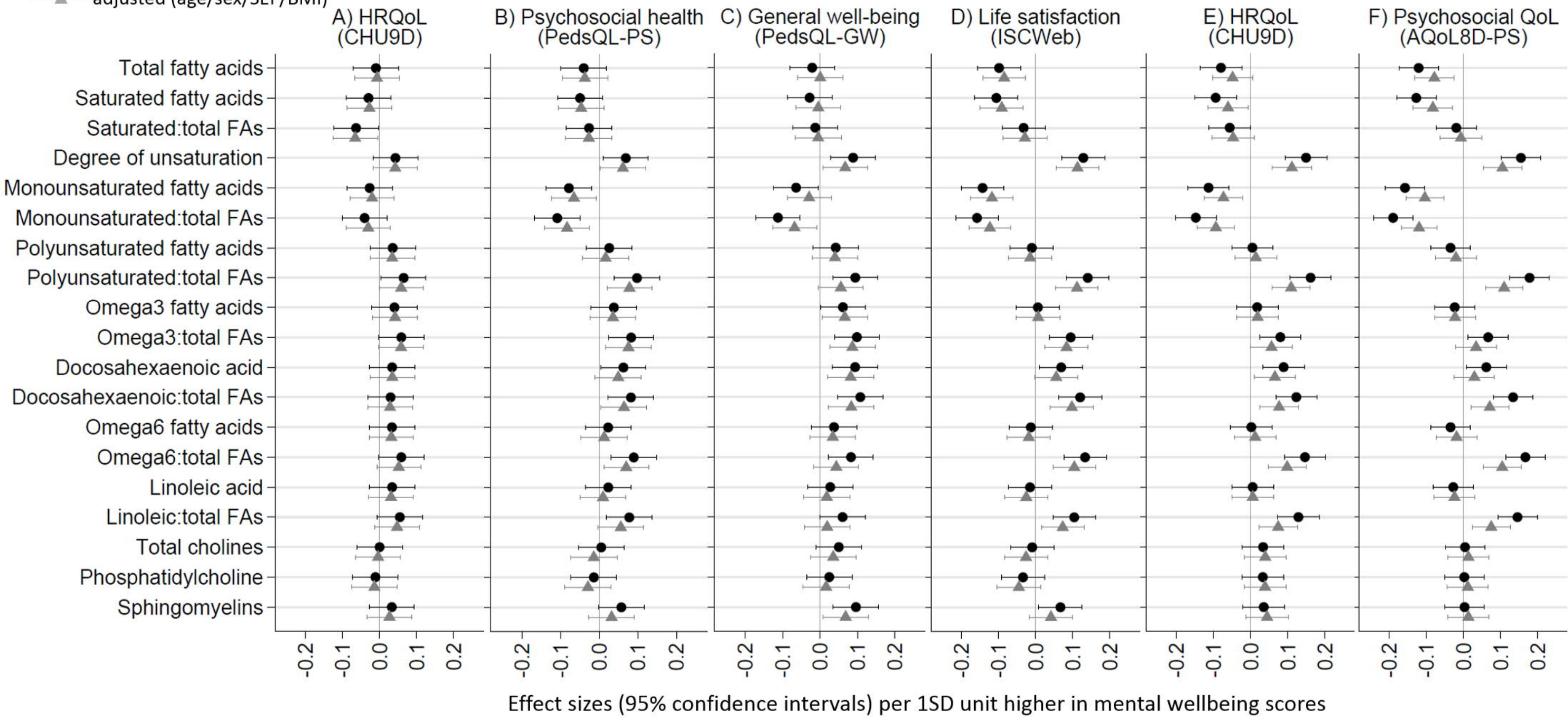
Figure3. Associations of mental health with other metabolite profiles (apolipoproteins, ketone and glycolysis metabolites, amino acids, inflammation and fluid balance factors) in children (A-D) and adults (E-F).

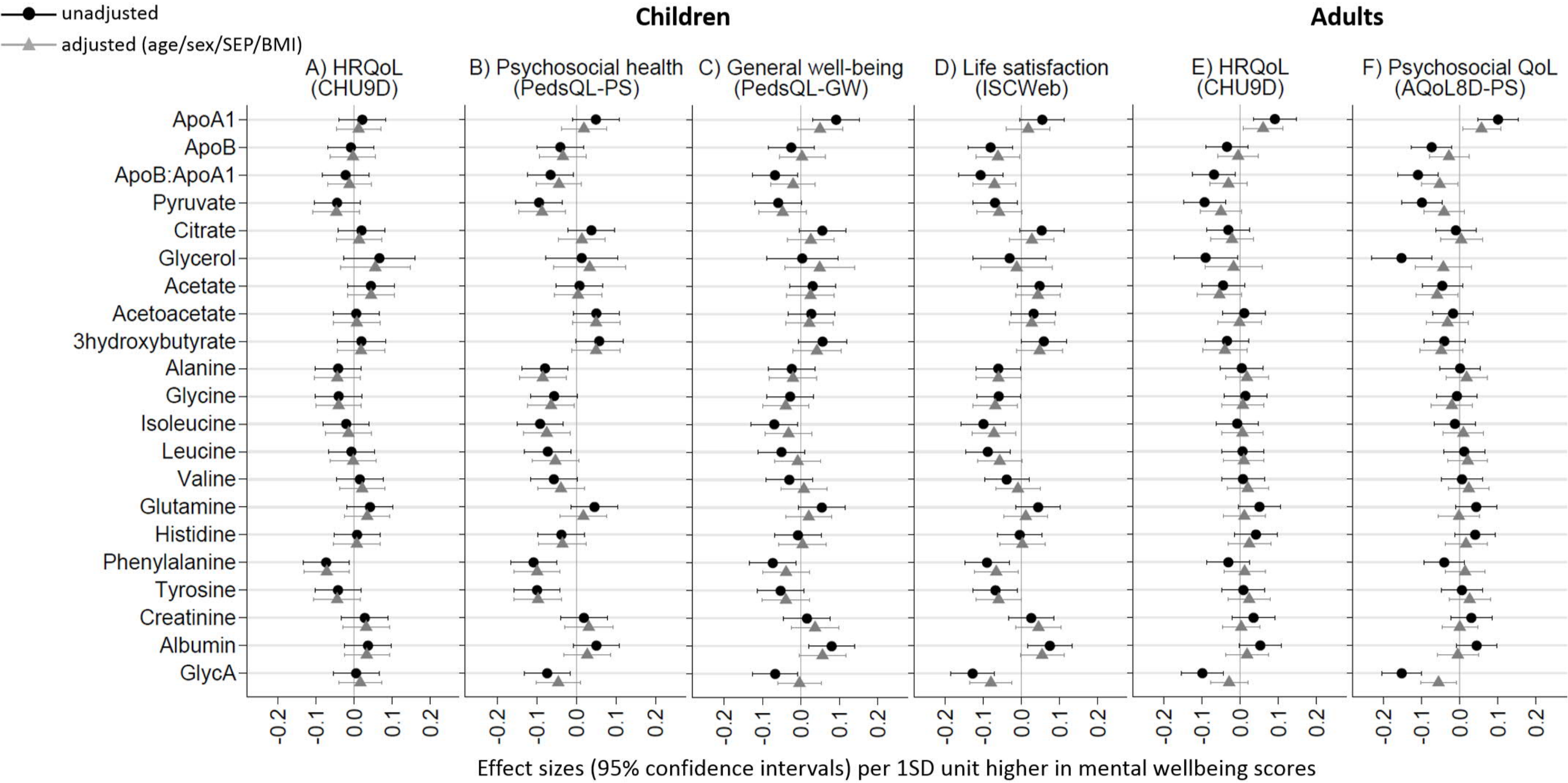


● unadjusted
▲ adjusted (age/sex/SEP/BMI)

Children

Adults





Cross-sectional metabolic profiles of mental health in population-based cohorts of 11-12 year olds and mid-life adults: the Longitudinal Study of Australian Children

Short title: Metabolic profiles of mental health

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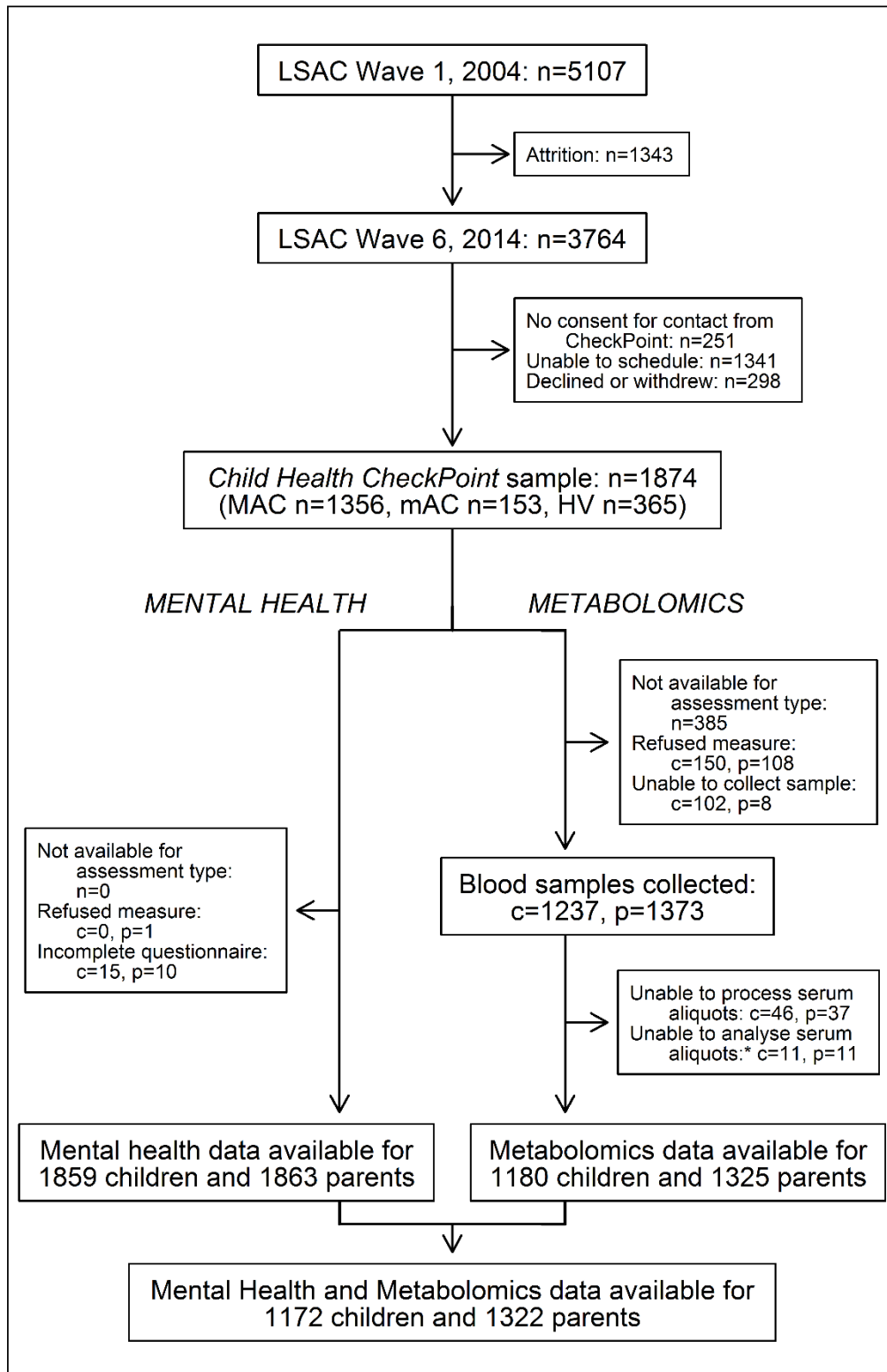
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Supplementary Material

Figure S1. Participant flow chart and sample size.



n, number of families; c, number of children; p, number of attending adults; LSAC, Longitudinal Study of Australian Children; MAC, Main assessment centre; mAC, Mini assessment centre; HV, Home visit assessment; *Unable to analyse due to insufficient volume or poor quality sample.

Table S1. Details of validated instruments used to collect mental health, venous blood and covariate data.

Measure	Instrument	Additional information
Child life satisfaction (5-items)	International Survey of Children's Well-being (ISCW) Brief Multidimensional Students' Life Satisfaction sub-scale (Seligson et al., 2003)	Questions are framed from a positive perspective over life as a whole (no specific recall time), and assess 5 life domains: family, friends, school, local area and body. Each item is scored on an 11-point Likert scale (Seligson et al., 2003). The total summed life satisfaction score is linearly transformed to a 0 to 100 scale, with higher scores indicating better life satisfaction. It has good internal consistency reliability ($\alpha=0.75$) (Huebner et al., 2006).
Child general well-being (7-items)	Paediatric Quality of Life 4.0 (Varni et al., 2001) General Well-being sub-scale (PedsQL-GW)	Questions are framed from a positive perspective over a recall time of one month, and assess happiness, perceived support and optimism about the future. Each item is scored on a 5-point Likert scale. The total summed score is linearly transformed to a 0 to 100 scale, where higher scores indicate better general well-being. It has good internal consistency reliability ($\alpha=0.70-0.92$) (Nicholson and Rempel, 2004).
Child psychosocial health (15-items)	Paediatric Quality of Life 4.0 (Varni et al., 2001) Psychosocial Health sub-scale (PedsQL-PS)	Questions are framed from a negative perspective over a one month recall time, and assess emotional, social and school functioning (Varni et al., 2006). Items are reverse-scored on a 5-point Likert scale. The total summed score is linearly transformed to a 0 to 100 scale, where higher scores indicate better psychosocial health. The Psychosocial Health Summary Score has good internal consistency reliability ($\alpha= 0.83$ child, 0.86 adults) (Varni et al., 2001).
Child and adult health related quality of life (9-items)	Child Health Utility 9D (CHU9D) (Stevens, 2011)	Questions are framed from a negative perspective, assessing functioning "today" across the domains of sadness, worry, tiredness, pain, annoyance, daily routine, sleep and activities. Each item is scored on a 5-point Likert scale, with each domain being weighted according to the utility values determined for Australian children (Ratcliffe et al., 2016). Scores represent a weighted sum on a 0-1 scale, with higher scores indicating better health related quality of life. It has good internal consistency reliability ($\alpha=0.78$) (Furber and Segal, 2015). The wording of questions were modified for use in adults.
Adult psychosocial quality of life (25-items)	Assessment of quality of life 8D (Richardson et al., 2014) Psychosocial Health sub-scale	Questions are framed from a negative, positive or neutral perspective, and assess functioning over the past month across the domains of relationships, mental health, coping, happiness and self-worth (Richardson et al., 2014). Each item is scored on a 4- to 6-point Likert scale. Scores represent a weighted sum on a 0-1 scale, where higher

Measure	Instrument	Additional information
	(AQoL8D-PS)	scores indicate better psychosocial quality of life. It has good internal consistency reliability ($\alpha = 0.96$) (Richardson et al., 2014).
Venous blood	S-Monovette vacutainers using 9 ml Serum Gel with Clotting Activator (02.1388.001), Sarstedt, Australia	Approximately 28mL blood collected from the non-dominant arm of seated, semi-fasted participants, processed into up to 6 serum 0.5mL aliquots per participant and stored at -80°C on site. Mean fasting time prior to blood collection was 4.4 hours (SD 2.1 hours) for children and 3.4 hours (SD 2.2 hours) for adults. Mean time of day for blood collection was 14:07 (SD 2:02) for children and 13:01 (SD 2:03) for adults.
BMI	Height: Portable rigid stadiometer (Invicta IP0955, Leicester, UK). Weight: 4-limb segmental body composition scales (InBody230, Biospace, Seoul, Korea).	Standing height without shoes or socks, measured x2, or x3 if first two measures differed by $\geq 0.5\text{cm}$. Weight and body composition wearing light clothing without shoes or socks, measured once. BMI was derived using the formula $\text{height(m)}/\text{weight(kg)}^2$. For children, BMI z-scores were generated using age- and sex-specific CDC growth charts (Ogden et al., 2002).

Table S2. Metabolites used in analyses.

Metabolite group	Metabolite	Units	Children mean (SD)	Adults mean (SD)
Lipids, Cholesterol and Triglycerides	Total cholesterol	mmol/L	3.60 (0.63)	4.25 (0.82)
	Remnant cholesterol	mmol/L	0.97 (0.27)	1.23 (0.38)
	Esterified cholesterol	mmol/L	2.53 (0.45)	2.99 (0.59)
	Free cholesterol	mmol/L	1.08 (0.18)	1.26 (0.24)
	Total triglycerides	mmol/L	1.02 (0.46)	1.28 (0.69)
	Total phosphoglycerides	mmol/L	1.63 (0.25)	1.93 (0.34)
	VLDL diameter	nm	37.07 (1.58)	36.97 (1.68)
	xL VLDL lipids	mmol/L	0.03 (0.03)	0.04 (0.04)
	vL VLDL lipids	mmol/L	0.06 (0.07)	0.08 (0.10)
	L VLDL lipids	mmol/L	0.22 (0.21)	0.30 (0.30)
	M VLDL lipids	mmol/L	0.45 (0.27)	0.56 (0.40)
	S VLDL lipids	mmol/L	0.39 (0.15)	0.50 (0.22)
	vS VLDL lipids	mmol/L	0.33 (0.07)	0.43 (0.11)
	VLDL cholesterol	mmol/L	0.45 (0.18)	0.60 (0.28)
	VLDL triglycerides	mmol/L	0.70 (0.43)	0.87 (0.63)
	LDL diameter	nm	23.61 (0.11)	23.56 (0.10)
	L LDL lipids	mmol/L	0.94 (0.23)	1.16 (0.29)
	M LDL lipids	mmol/L	0.52 (0.14)	0.66 (0.18)
	S LDL lipids	mmol/L	0.34 (0.09)	0.43 (0.11)
	LDL cholesterol	mmol/L	1.15 (0.34)	1.47 (0.44)
	LDL triglycerides	mmol/L	0.12 (0.03)	0.16 (0.04)
	IDL lipids	mmol/L	0.82 (0.18)	1.00 (0.24)
	IDL cholesterol	mmol/L	0.52 (0.13)	0.63 (0.16)
	IDL triglycerides	mmol/L	0.08 (0.02)	0.10 (0.03)
	HDL diameter	nm	10.10 (0.23)	10.06 (0.28)
	vL HDL lipids	mmol/L	0.50 (0.19)	0.50 (0.24)
	L HDL lipids	mmol/L	0.87 (0.28)	0.89 (0.41)
	M HDL lipids	mmol/L	0.89 (0.13)	0.96 (0.18)
	S HDL lipids	mmol/L	1.01 (0.12)	1.08 (0.14)
	HDL1 cholesterol	mmol/L	1.49 (0.27)	1.55 (0.38)
	HDL2 cholesterol	mmol/L	1.02 (0.25)	1.07 (0.35)
	HDL3 cholesterol	mmol/L	0.47 (0.02)	0.48 (0.03)
	HDL triglycerides	mmol/L	0.13 (0.03)	0.15 (0.04)

Metabolite group	Metabolite	Units	Children mean (SD)	Adults mean (SD)
Fatty Acids and Cholines	Total fatty acids	mmol/L	9.25 (1.65)	10.97 (2.39)
	Saturated fatty acids	mmol/L	3.35 (0.64)	3.96 (0.93)
	Saturated:total FAs		36.19 (1.74)	36.01 (1.96)
	Degree of unsaturation		1.21 (0.06)	1.21 (0.07)
	Monounsaturated fatty acids	mmol/L	2.52 (0.62)	3.09 (0.93)
	Monounsaturated:total FAs		26.99 (2.61)	27.81 (2.90)
	Polyunsaturated fatty acids	mmol/L	3.38 (0.55)	3.93 (0.71)
	Polyunsaturated:total FAs		36.82 (3.35)	36.19 (3.62)
	Omega3 fatty acids	mmol/L	0.30 (0.08)	0.41 (0.12)
	Omega3:total FAs		3.27 (0.59)	3.71 (0.71)
	22:6, docosahexaenoic acid	mmol/L	0.08 (0.03)	0.11 (0.04)
	Docosahexaenoic:total FAs		0.83 (0.25)	1.04 (0.29)
	Omega6 fatty acids	mmol/L	3.08 (0.48)	3.52 (0.61)
	Omega6:total FAs		33.55 (3.11)	32.48 (3.38)
	18:2, linoleic acid	mmol/L	2.56 (0.46)	2.89 (0.57)
	Linoleic:total FAs		27.81 (3.23)	26.65 (3.43)
	Total cholines	mmol/L	2.00 (0.26)	2.32 (0.35)
	Phosphatidylcholine	mmol/L	1.69 (0.25)	1.98 (0.33)
Sphingomyelins	mmol/L	0.35 (0.06)	0.40 (0.08)	

Metabolite group	Metabolite	Units	Children mean (SD)	Adults mean (SD)
	ApoA1	g/L	1.50 (0.16)	1.59 (0.21)
	ApoB	g/L	0.69 (0.13)	0.82 (0.20)
	ApoB:ApoA1		0.47 (0.10)	0.52 (0.14)
	Pyruvate	mmol/L	0.10 (0.02)	0.09 (0.03)
	Citrate	mmol/L	0.13 (0.02)	0.11 (0.02)
	Glycerol	mmol/L	0.08 (0.02)	0.07 (0.02)
	Acetate	mmol/L	0.03 (0.01)	0.04 (0.04)
	Acetoacetate	mmol/L	0.03 (0.02)	0.03 (0.02)
	3hydroxybutyrate	mmol/L	0.12 (0.09)	0.11 (0.08)
	Alanine	mmol/L	0.39 (0.06)	0.40 (0.06)
Other	Glycine	mmol/L	0.26 (0.03)	0.27 (0.06)
	Isoleucine	mmol/L	0.05 (0.02)	0.06 (0.02)
	Leucine	mmol/L	0.07 (0.02)	0.08 (0.02)
	Valine	mmol/L	0.16 (0.04)	0.17 (0.04)
	Glutamine	mmol/L	0.48 (0.05)	0.46 (0.07)
	Histidine	mmol/L	0.06 (0.01)	0.07 (0.01)
	Phenylalanine	mmol/L	0.07 (0.01)	0.07 (0.01)
	Tyrosine	mmol/L	0.05 (0.01)	0.05 (0.01)
	Creatinine	mmol/L	0.04 (0.01)	0.06 (0.01)
	Albumin	signal area	0.09 (0.00)	0.09 (0.01)
	GlycA	mmol/L	1.16 (0.18)	1.23 (0.24)

xL, extra large; vL, very large; L, large; M, medium; S, small; vS, very small; VLDL, very low density lipoproteins; LDL, low density lipoproteins; IDL, intermediate density lipoproteins; HDL, high density lipoproteins; FAs, fatty acids; ApoA1, Apolipoprotein A1; ApoB, Apolipoprotein B; GlycA, Glycoprotein acetyls.

Table S3. Standardised effect size and 95% confidence interval for each metabolite per SD unit increase in mental health score, for unadjusted regression, and adjusted for age, sex, SEP, and BMI (for adults) or BMI CDC z-score (for children).

		<i>Unadjusted standardised effect size (95% CI)</i>					
Group	Metabolite	Child				Adult	
		CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.01 (-0.05, 0.07)	0.02 (-0.03, 0.08)	0.06 (0.00, 0.12)	0.03 (-0.03, 0.08)	0.06 (0.00, 0.11)	0.04 (-0.01, 0.10)
	Remnant cholesterol	-0.01 (-0.07, 0.05)	-0.04 (-0.09, 0.02)	-0.02 (-0.08, 0.04)	-0.07 (-0.13, -0.02)	-0.03 (-0.08, 0.03)	-0.06 (-0.11, -0.01)
	Esterified cholesterol	0.01 (-0.05, 0.07)	0.02 (-0.04, 0.08)	0.06 (0.00, 0.12)	0.02 (-0.04, 0.08)	0.06 (0.00, 0.11)	0.04 (-0.01, 0.10)
	Free cholesterol	0.02 (-0.04, 0.08)	0.04 (-0.02, 0.10)	0.08 (0.01, 0.14)	0.04 (-0.02, 0.10)	0.06 (0.00, 0.11)	0.04 (-0.01, 0.10)
	Total triglycerides	-0.02 (-0.08, 0.04)	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.03)	-0.15 (-0.21, -0.09)	-0.08 (-0.14, -0.02)	-0.12 (-0.17, -0.07)
	Total phosphoglycerides	-0.01 (-0.08, 0.05)	-0.02 (-0.08, 0.04)	0.02 (-0.04, 0.08)	-0.04 (-0.10, 0.02)	0.06 (0.00, 0.11)	0.03 (-0.02, 0.09)
	VLDL diameter	-0.02 (-0.08, 0.04)	-0.07 (-0.13, -0.01)	-0.11 (-0.17, -0.05)	-0.13 (-0.19, -0.07)	-0.11 (-0.16, -0.05)	-0.14 (-0.19, -0.09)
	xL VLDL lipids	-0.04 (-0.10, 0.03)	-0.09 (-0.15, -0.03)	-0.09 (-0.15, -0.03)	-0.15 (-0.20, -0.09)	-0.08 (-0.13, -0.02)	-0.11 (-0.16, -0.05)
	vL VLDL lipids	-0.03 (-0.09, 0.03)	-0.09 (-0.14, -0.03)	-0.09 (-0.15, -0.03)	-0.15 (-0.21, -0.09)	-0.08 (-0.14, -0.03)	-0.12 (-0.17, -0.06)
	L VLDL lipids	-0.03 (-0.09, 0.03)	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.03)	-0.15 (-0.21, -0.09)	-0.08 (-0.14, -0.03)	-0.12 (-0.17, -0.07)
	M VLDL lipids	-0.02 (-0.08, 0.04)	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.03)	-0.14 (-0.20, -0.09)	-0.08 (-0.14, -0.02)	-0.12 (-0.17, -0.07)
	S VLDL lipids	-0.01 (-0.07, 0.05)	-0.07 (-0.13, -0.01)	-0.07 (-0.13, -0.01)	-0.13 (-0.19, -0.07)	-0.07 (-0.12, -0.01)	-0.11 (-0.17, -0.06)
	vS VLDL lipids	0.01 (-0.05, 0.07)	0.00 (-0.05, 0.06)	0.03 (-0.03, 0.09)	0.00 (-0.06, 0.05)	-0.01 (-0.07, 0.05)	-0.04 (-0.10, 0.01)
	VLDL cholesterol	-0.02 (-0.08, 0.04)	-0.07 (-0.13, -0.01)	-0.06 (-0.12, 0.00)	-0.13 (-0.18, -0.07)	-0.06 (-0.11, 0.00)	-0.10 (-0.15, -0.04)
	VLDL triglycerides	-0.02 (-0.08, 0.04)	-0.08 (-0.14, -0.02)	-0.09 (-0.15, -0.04)	-0.15 (-0.21, -0.09)	-0.08 (-0.14, -0.03)	-0.13 (-0.18, -0.07)
	LDL diameter	-0.01 (-0.07, 0.05)	0.05 (-0.01, 0.10)	0.02 (-0.04, 0.08)	0.03 (-0.03, 0.09)	-0.04 (-0.10, 0.01)	0.00 (-0.05, 0.06)
	L LDL lipids	0.01 (-0.05, 0.07)	0.02 (-0.04, 0.08)	0.05 (-0.01, 0.11)	0.03 (-0.03, 0.09)	0.03 (-0.02, 0.09)	0.02 (-0.04, 0.07)
	M LDL lipids	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.05 (-0.01, 0.11)	0.03 (-0.03, 0.09)	0.03 (-0.02, 0.09)	0.01 (-0.04, 0.07)
	S LDL lipids	0.02 (-0.04, 0.08)	0.01 (-0.05, 0.07)	0.04 (-0.02, 0.10)	0.03 (-0.03, 0.09)	0.04 (-0.02, 0.09)	0.02 (-0.03, 0.07)
	LDL cholesterol	0.01 (-0.05, 0.07)	0.01 (-0.04, 0.07)	0.05 (-0.01, 0.11)	0.03 (-0.03, 0.09)	0.04 (-0.02, 0.09)	0.02 (-0.03, 0.08)

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	LDL triglycerides	-0.01 (-0.07, 0.05)	0.00 (-0.06, 0.06)	0.03 (-0.03, 0.09)	-0.05 (-0.11, 0.01)	0.00 (-0.06, 0.06)	-0.03 (-0.08, 0.03)
	IDL lipids	0.01 (-0.06, 0.07)	0.02 (-0.04, 0.08)	0.05 (-0.01, 0.11)	0.02 (-0.03, 0.08)	0.03 (-0.03, 0.08)	0.02 (-0.04, 0.07)
	IDL cholesterol	0.01 (-0.05, 0.07)	0.03 (-0.03, 0.08)	0.05 (-0.01, 0.11)	0.03 (-0.03, 0.09)	0.03 (-0.03, 0.09)	0.02 (-0.03, 0.08)
	IDL triglycerides	0.01 (-0.05, 0.07)	0.02 (-0.04, 0.07)	0.02 (-0.04, 0.08)	-0.03 (-0.09, 0.03)	-0.02 (-0.08, 0.03)	-0.05 (-0.10, 0.00)
	HDL diameter	0.00 (-0.06, 0.06)	0.07 (0.01, 0.13)	0.10 (0.04, 0.16)	0.08 (0.03, 0.14)	0.09 (0.03, 0.14)	0.13 (0.07, 0.18)
	vL HDL lipids	-0.01 (-0.07, 0.06)	0.06 (0.00, 0.12)	0.10 (0.04, 0.16)	0.07 (0.01, 0.12)	0.09 (0.04, 0.15)	0.12 (0.07, 0.17)
	L HDL lipids	0.02 (-0.04, 0.08)	0.08 (0.02, 0.14)	0.11 (0.05, 0.17)	0.10 (0.04, 0.16)	0.10 (0.05, 0.16)	0.13 (0.08, 0.18)
	M HDL lipids	0.05 (-0.01, 0.11)	0.05 (-0.01, 0.11)	0.04 (-0.02, 0.10)	0.05 (-0.01, 0.10)	0.05 (-0.01, 0.10)	0.06 (0.00, 0.11)
	S HDL lipids	0.07 (0.01, 0.13)	0.04 (-0.02, 0.09)	0.00 (-0.06, 0.06)	0.02 (-0.04, 0.08)	0.01 (-0.05, 0.07)	-0.01 (-0.06, 0.04)
	HDL1 cholesterol	0.03 (-0.03, 0.09)	0.07 (0.02, 0.13)	0.11 (0.05, 0.17)	0.09 (0.04, 0.15)	0.11 (0.05, 0.16)	0.13 (0.08, 0.18)
	HDL2 cholesterol	0.03 (-0.03, 0.09)	0.08 (0.02, 0.13)	0.11 (0.05, 0.17)	0.10 (0.04, 0.15)	0.11 (0.05, 0.16)	0.13 (0.08, 0.18)
	HDL3 cholesterol	0.01 (-0.05, 0.07)	0.05 (0.00, 0.11)	0.09 (0.03, 0.15)	0.05 (-0.01, 0.11)	0.11 (0.06, 0.17)	0.11 (0.05, 0.16)
	HDL triglycerides	-0.02 (-0.08, 0.04)	-0.03 (-0.09, 0.03)	-0.03 (-0.09, 0.03)	-0.11 (-0.17, -0.05)	-0.03 (-0.08, 0.03)	-0.05 (-0.10, 0.00)
Fatty Acids and Cholines	Total fatty acids	-0.01 (-0.07, 0.05)	-0.04 (-0.10, 0.02)	-0.02 (-0.08, 0.04)	-0.10 (-0.16, -0.04)	-0.03 (-0.09, 0.03)	-0.06 (-0.11, -0.01)
	Saturated fatty acids	-0.03 (-0.09, 0.03)	-0.05 (-0.11, 0.01)	-0.03 (-0.09, 0.03)	-0.11 (-0.16, -0.05)	-0.03 (-0.09, 0.02)	-0.06 (-0.11, -0.01)
	Saturated:total FAs	-0.06 (-0.12, 0.00)	-0.03 (-0.09, 0.03)	-0.01 (-0.07, 0.05)	-0.03 (-0.09, 0.03)	-0.01 (-0.07, 0.04)	0.00 (-0.06, 0.05)
	Degree of unsaturation	0.04 (-0.02, 0.10)	0.07 (0.01, 0.13)	0.09 (0.03, 0.15)	0.13 (0.07, 0.19)	0.14 (0.09, 0.20)	0.14 (0.09, 0.19)
	Monounsaturated fatty acids	-0.03 (-0.09, 0.03)	-0.08 (-0.14, -0.02)	-0.06 (-0.12, 0.00)	-0.14 (-0.20, -0.09)	-0.06 (-0.12, -0.01)	-0.10 (-0.16, -0.05)
	Monounsaturated:total FAs	-0.04 (-0.10, 0.02)	-0.11 (-0.17, -0.05)	-0.11 (-0.17, -0.05)	-0.16 (-0.22, -0.10)	-0.12 (-0.17, -0.06)	-0.17 (-0.23, -0.12)
	Polyunsaturated fatty acids	0.04 (-0.03, 0.10)	0.03 (-0.03, 0.09)	0.04 (-0.02, 0.10)	-0.01 (-0.07, 0.05)	0.03 (-0.03, 0.08)	0.02 (-0.04, 0.07)
	Polyunsaturated:total FAs	0.06 (0.00, 0.13)	0.10 (0.04, 0.16)	0.09 (0.03, 0.15)	0.14 (0.08, 0.20)	0.10 (0.04, 0.16)	0.14 (0.09, 0.19)
	Omega3 fatty acids	0.04 (-0.02, 0.10)	0.04 (-0.02, 0.10)	0.06 (0.00, 0.12)	0.01 (-0.05, 0.06)	0.07 (0.01, 0.12)	0.04 (-0.02, 0.09)
	Omega3:total FAs	0.06 (0.00, 0.12)	0.08 (0.02, 0.14)	0.10 (0.04, 0.16)	0.09 (0.04, 0.15)	0.13 (0.08, 0.19)	0.12 (0.07, 0.18)
	22:6, docosahexaenoic acid	0.03 (-0.03, 0.09)	0.06 (0.00, 0.12)	0.09 (0.03, 0.15)	0.07 (0.01, 0.13)	0.10 (0.05, 0.16)	0.07 (0.01, 0.12)
	Docosahexaenoic:total FAs	0.03 (-0.03, 0.09)	0.08 (0.02, 0.14)	0.11 (0.05, 0.17)	0.12 (0.06, 0.18)	0.15 (0.09, 0.20)	0.13 (0.07, 0.18)

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	Omega6 fatty acids	0.03 (-0.03, 0.09)	0.02 (-0.04, 0.08)	0.04 (-0.02, 0.10)	-0.01 (-0.07, 0.04)	0.02 (-0.04, 0.07)	0.01 (-0.04, 0.06)
	Omega6:total FAs	0.06 (0.00, 0.12)	0.09 (0.03, 0.15)	0.08 (0.02, 0.14)	0.13 (0.08, 0.19)	0.08 (0.02, 0.14)	0.13 (0.07, 0.18)
	18:2, linoleic acid	0.03 (-0.03, 0.09)	0.02 (-0.04, 0.08)	0.03 (-0.03, 0.09)	-0.02 (-0.07, 0.04)	0.00 (-0.05, 0.06)	0.01 (-0.04, 0.06)
	Linoleic:total FAs	0.05 (-0.01, 0.12)	0.08 (0.02, 0.14)	0.06 (0.00, 0.12)	0.10 (0.05, 0.16)	0.05 (0.00, 0.11)	0.10 (0.05, 0.15)
	Total cholines	0.00 (-0.06, 0.06)	0.01 (-0.05, 0.06)	0.05 (-0.01, 0.11)	-0.01 (-0.07, 0.05)	0.07 (0.01, 0.12)	0.05 (0.00, 0.11)
	Phosphatidylcholine	-0.01 (-0.07, 0.05)	-0.01 (-0.07, 0.05)	0.02 (-0.04, 0.09)	-0.03 (-0.09, 0.02)	0.06 (0.00, 0.12)	0.04 (-0.01, 0.09)
	Sphingomyelins	0.03 (-0.03, 0.09)	0.06 (0.00, 0.12)	0.10 (0.04, 0.16)	0.07 (0.01, 0.12)	0.06 (0.00, 0.11)	0.06 (0.01, 0.12)
	ApoA1	0.02 (-0.04, 0.08)	0.05 (-0.01, 0.11)	0.09 (0.03, 0.15)	0.05 (0.00, 0.11)	0.10 (0.04, 0.15)	0.10 (0.05, 0.16)
	ApoB	-0.01 (-0.07, 0.05)	-0.04 (-0.10, 0.02)	-0.03 (-0.09, 0.03)	-0.08 (-0.14, -0.02)	-0.03 (-0.09, 0.02)	-0.07 (-0.12, -0.02)
	ApoB:ApoA1	-0.02 (-0.08, 0.04)	-0.07 (-0.12, -0.01)	-0.07 (-0.13, -0.01)	-0.11 (-0.17, -0.05)	-0.07 (-0.13, -0.02)	-0.11 (-0.17, -0.06)
	Pyruvate	-0.04 (-0.11, 0.02)	-0.09 (-0.15, -0.04)	-0.06 (-0.12, 0.00)	-0.07 (-0.13, -0.01)	-0.10 (-0.15, -0.04)	-0.11 (-0.16, -0.05)
	Citrate	0.02 (-0.04, 0.08)	0.04 (-0.02, 0.10)	0.06 (-0.01, 0.12)	0.05 (-0.01, 0.11)	-0.02 (-0.07, 0.04)	0.00 (-0.05, 0.06)
	Glycerol	0.07 (-0.03, 0.16)	0.01 (-0.08, 0.11)	0.00 (-0.09, 0.10)	-0.03 (-0.13, 0.06)	-0.10 (-0.18, -0.01)	-0.14 (-0.22, -0.06)
	Acetate	0.04 (-0.02, 0.10)	0.01 (-0.05, 0.07)	0.03 (-0.03, 0.09)	0.05 (-0.01, 0.11)	-0.04 (-0.10, 0.01)	-0.05 (-0.10, 0.01)
	Acetoacetate	0.01 (-0.06, 0.07)	0.05 (-0.01, 0.11)	0.03 (-0.03, 0.09)	0.03 (-0.03, 0.09)	0.00 (-0.05, 0.06)	-0.02 (-0.08, 0.03)
Other	3hydroxybutyrate	0.02 (-0.04, 0.08)	0.06 (0.00, 0.12)	0.06 (-0.01, 0.12)	0.06 (0.00, 0.12)	-0.03 (-0.08, 0.03)	-0.04 (-0.10, 0.01)
	Alanine	-0.04 (-0.10, 0.02)	-0.08 (-0.14, -0.02)	-0.02 (-0.08, 0.04)	-0.06 (-0.12, 0.00)	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.06)
	Glycine	-0.04 (-0.10, 0.02)	-0.06 (-0.11, 0.00)	-0.03 (-0.09, 0.03)	-0.06 (-0.12, 0.00)	0.00 (-0.05, 0.06)	-0.02 (-0.07, 0.03)
	Isoleucine	-0.02 (-0.08, 0.04)	-0.09 (-0.15, -0.03)	-0.07 (-0.13, -0.01)	-0.10 (-0.16, -0.04)	-0.05 (-0.10, 0.01)	-0.06 (-0.11, 0.00)
	Leucine	-0.01 (-0.07, 0.05)	-0.07 (-0.13, -0.01)	-0.05 (-0.11, 0.01)	-0.09 (-0.15, -0.03)	-0.02 (-0.07, 0.04)	-0.03 (-0.08, 0.03)
	Valine	0.01 (-0.05, 0.08)	-0.06 (-0.12, 0.00)	-0.03 (-0.09, 0.03)	-0.04 (-0.10, 0.02)	0.02 (-0.04, 0.07)	0.02 (-0.04, 0.07)
	Glutamine	0.04 (-0.02, 0.10)	0.05 (-0.01, 0.10)	0.05 (-0.01, 0.11)	0.04 (-0.01, 0.10)	0.05 (-0.01, 0.11)	0.04 (-0.01, 0.10)
	Histidine	0.01 (-0.05, 0.07)	-0.04 (-0.10, 0.02)	-0.01 (-0.07, 0.05)	0.00 (-0.06, 0.05)	0.06 (0.00, 0.11)	0.05 (0.00, 0.10)
	Phenylalanine	-0.07 (-0.13, -0.01)	-0.11 (-0.17, -0.05)	-0.07 (-0.13, -0.01)	-0.09 (-0.15, -0.03)	-0.05 (-0.11, 0.00)	-0.06 (-0.12, -0.01)
	Tyrosine	-0.04 (-0.10, 0.02)	-0.10 (-0.16, -0.04)	-0.05 (-0.11, 0.01)	-0.07 (-0.13, -0.01)	0.01 (-0.04, 0.07)	0.00 (-0.05, 0.06)

	Creatinine	0.03 (-0.03, 0.09)	0.02 (-0.04, 0.08)	0.02 (-0.05, 0.08)	0.03 (-0.03, 0.08)	0.08 (0.02, 0.13)	0.08 (0.02, 0.13)
	Albumin	0.04 (-0.02, 0.10)	0.05 (-0.01, 0.11)	0.08 (0.02, 0.14)	0.07 (0.02, 0.13)	0.06 (0.01, 0.12)	0.05 (0.00, 0.10)
	GlycA	0.00 (-0.06, 0.07)	-0.07 (-0.13, -0.01)	-0.07 (-0.13, -0.01)	-0.13 (-0.19, -0.07)	-0.10 (-0.15, -0.04)	-0.15 (-0.20, -0.10)
<i>Adjusted standardised effect size (95% CI)</i>							
		Child				Adult	
Group	Metabolite	CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.05 (-0.01, 0.11)	0.01 (-0.05, 0.07)	0.05 (-0.01, 0.11)	0.04 (-0.01, 0.10)
	Remnant cholesterol	-0.01 (-0.07, 0.05)	-0.03 (-0.09, 0.03)	0.01 (-0.05, 0.07)	-0.06 (-0.12, 0.00)	0.00 (-0.06, 0.05)	-0.02 (-0.07, 0.04)
	Esterified cholesterol	0.01 (-0.05, 0.07)	0.00 (-0.06, 0.06)	0.05 (-0.02, 0.11)	0.01 (-0.05, 0.07)	0.05 (-0.01, 0.11)	0.04 (-0.01, 0.10)
	Free cholesterol	0.02 (-0.05, 0.08)	0.02 (-0.04, 0.08)	0.06 (0.00, 0.12)	0.02 (-0.04, 0.08)	0.05 (-0.01, 0.11)	0.04 (-0.02, 0.09)
	Total triglycerides	-0.01 (-0.07, 0.04)	-0.06 (-0.12, 0.00)	-0.04 (-0.10, 0.01)	-0.12 (-0.17, -0.06)	-0.04 (-0.09, 0.01)	-0.07 (-0.12, -0.02)
	Total phosphoglycerides	-0.02 (-0.08, 0.04)	-0.03 (-0.09, 0.03)	0.01 (-0.05, 0.08)	-0.05 (-0.11, 0.01)	0.05 (0.00, 0.11)	0.03 (-0.02, 0.09)
	VLDL diameter	-0.01 (-0.07, 0.05)	-0.05 (-0.11, 0.01)	-0.07 (-0.13, -0.01)	-0.10 (-0.16, -0.04)	-0.07 (-0.11, -0.02)	-0.08 (-0.13, -0.03)
	xL VLDL lipids	-0.03 (-0.09, 0.03)	-0.08 (-0.13, -0.02)	-0.05 (-0.11, 0.01)	-0.12 (-0.18, -0.06)	-0.05 (-0.10, 0.00)	-0.06 (-0.11, -0.01)
	vL VLDL lipids	-0.03 (-0.09, 0.03)	-0.07 (-0.13, -0.01)	-0.05 (-0.11, 0.01)	-0.12 (-0.18, -0.06)	-0.05 (-0.10, 0.00)	-0.07 (-0.12, -0.02)
	L VLDL lipids	-0.02 (-0.08, 0.04)	-0.06 (-0.12, 0.00)	-0.05 (-0.10, 0.01)	-0.12 (-0.17, -0.06)	-0.05 (-0.10, 0.01)	-0.07 (-0.12, -0.02)
	M VLDL lipids	-0.01 (-0.07, 0.05)	-0.06 (-0.11, 0.00)	-0.04 (-0.10, 0.02)	-0.11 (-0.17, -0.05)	-0.04 (-0.09, 0.01)	-0.06 (-0.11, -0.02)
	S VLDL lipids	0.00 (-0.06, 0.05)	-0.05 (-0.11, 0.01)	-0.03 (-0.08, 0.03)	-0.10 (-0.15, -0.04)	-0.03 (-0.08, 0.02)	-0.05 (-0.10, 0.00)
	vS VLDL lipids	0.02 (-0.04, 0.08)	0.01 (-0.05, 0.07)	0.04 (-0.02, 0.10)	0.01 (-0.05, 0.06)	0.01 (-0.04, 0.07)	0.00 (-0.06, 0.05)
	VLDL cholesterol	-0.01 (-0.07, 0.05)	-0.05 (-0.11, 0.01)	-0.02 (-0.08, 0.04)	-0.09 (-0.15, -0.04)	-0.02 (-0.08, 0.03)	-0.04 (-0.09, 0.01)
	VLDL triglycerides	-0.01 (-0.07, 0.04)	-0.06 (-0.12, 0.00)	-0.05 (-0.10, 0.01)	-0.12 (-0.17, -0.06)	-0.05 (-0.10, 0.00)	-0.07 (-0.12, -0.02)
	LDL diameter	-0.02 (-0.08, 0.04)	0.03 (-0.03, 0.09)	0.01 (-0.05, 0.07)	0.02 (-0.04, 0.08)	-0.03 (-0.08, 0.03)	0.02 (-0.03, 0.07)
	L LDL lipids	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.05 (-0.02, 0.11)	0.02 (-0.03, 0.08)	0.04 (-0.02, 0.09)	0.03 (-0.03, 0.08)
	M LDL lipids	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.05 (-0.02, 0.11)	0.02 (-0.03, 0.08)	0.04 (-0.02, 0.09)	0.03 (-0.03, 0.08)
	S LDL lipids	0.02 (-0.04, 0.08)	0.01 (-0.05, 0.07)	0.04 (-0.02, 0.10)	0.03 (-0.03, 0.08)	0.04 (-0.02, 0.09)	0.03 (-0.03, 0.08)

	LDL cholesterol	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.04 (-0.02, 0.11)	0.03 (-0.03, 0.09)	0.04 (-0.02, 0.09)	0.03 (-0.02, 0.09)
	LDL triglycerides	-0.01 (-0.07, 0.05)	-0.01 (-0.07, 0.05)	0.02 (-0.04, 0.08)	-0.06 (-0.12, 0.00)	0.02 (-0.04, 0.07)	0.00 (-0.06, 0.05)
	IDL lipids	0.00 (-0.06, 0.07)	0.01 (-0.05, 0.07)	0.05 (-0.02, 0.11)	0.02 (-0.04, 0.08)	0.03 (-0.02, 0.09)	0.03 (-0.03, 0.08)
	IDL cholesterol	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.05 (-0.01, 0.11)	0.02 (-0.03, 0.08)	0.03 (-0.02, 0.09)	0.03 (-0.02, 0.09)
	IDL triglycerides	0.01 (-0.05, 0.07)	0.01 (-0.04, 0.07)	0.03 (-0.03, 0.09)	-0.03 (-0.09, 0.03)	0.00 (-0.05, 0.06)	-0.01 (-0.07, 0.04)
	HDL diameter	-0.01 (-0.07, 0.04)	0.03 (-0.03, 0.09)	0.04 (-0.02, 0.10)	0.04 (-0.02, 0.09)	0.04 (-0.01, 0.09)	0.06 (0.02, 0.11)
	vL HDL lipids	-0.02 (-0.08, 0.04)	0.03 (-0.03, 0.08)	0.05 (-0.01, 0.11)	0.02 (-0.03, 0.08)	0.04 (-0.01, 0.09)	0.06 (0.01, 0.11)
	L HDL lipids	0.01 (-0.05, 0.06)	0.04 (-0.01, 0.10)	0.05 (0.00, 0.11)	0.05 (-0.01, 0.11)	0.06 (0.01, 0.11)	0.07 (0.02, 0.11)
	M HDL lipids	0.05 (-0.01, 0.10)	0.04 (-0.02, 0.10)	0.02 (-0.04, 0.08)	0.03 (-0.02, 0.09)	0.04 (-0.01, 0.10)	0.05 (-0.01, 0.10)
	S HDL lipids	0.07 (0.01, 0.13)	0.05 (-0.01, 0.10)	0.01 (-0.05, 0.07)	0.03 (-0.03, 0.09)	0.03 (-0.03, 0.09)	0.01 (-0.04, 0.07)
	HDL1 cholesterol	0.02 (-0.04, 0.07)	0.04 (-0.01, 0.10)	0.05 (0.00, 0.11)	0.05 (-0.01, 0.11)	0.07 (0.02, 0.11)	0.07 (0.02, 0.12)
	HDL2 cholesterol	0.02 (-0.04, 0.07)	0.04 (-0.01, 0.10)	0.05 (0.00, 0.11)	0.05 (0.00, 0.11)	0.06 (0.02, 0.11)	0.07 (0.02, 0.12)
	HDL3 cholesterol	0.00 (-0.05, 0.06)	0.03 (-0.03, 0.09)	0.05 (-0.01, 0.11)	0.02 (-0.04, 0.08)	0.08 (0.03, 0.13)	0.06 (0.01, 0.11)
	HDL triglycerides	-0.02 (-0.08, 0.04)	-0.04 (-0.10, 0.02)	-0.02 (-0.08, 0.04)	-0.10 (-0.16, -0.05)	-0.01 (-0.06, 0.05)	-0.02 (-0.07, 0.04)
Fatty Acids and Cholines	Total fatty acids	-0.01 (-0.07, 0.05)	-0.04 (-0.10, 0.02)	0.00 (-0.06, 0.06)	-0.08 (-0.14, -0.03)	-0.01 (-0.06, 0.05)	-0.02 (-0.07, 0.03)
	Saturated fatty acids	-0.03 (-0.09, 0.03)	-0.05 (-0.11, 0.01)	0.00 (-0.06, 0.06)	-0.09 (-0.15, -0.03)	-0.01 (-0.07, 0.05)	-0.02 (-0.08, 0.03)
	Saturated:total FAs	-0.07 (-0.13, -0.01)	-0.03 (-0.09, 0.03)	-0.01 (-0.07, 0.06)	-0.03 (-0.09, 0.03)	-0.01 (-0.07, 0.04)	-0.01 (-0.06, 0.05)
	Degree of unsaturation	0.04 (-0.02, 0.10)	0.06 (0.00, 0.12)	0.07 (0.01, 0.13)	0.11 (0.06, 0.17)	0.10 (0.05, 0.15)	0.08 (0.03, 0.13)
	Monounsaturated fatty acids	-0.02 (-0.08, 0.04)	-0.07 (-0.12, -0.01)	-0.03 (-0.09, 0.03)	-0.12 (-0.17, -0.06)	-0.03 (-0.08, 0.03)	-0.05 (-0.10, 0.00)
	Monounsaturated:total FAs	-0.03 (-0.09, 0.03)	-0.08 (-0.14, -0.03)	-0.07 (-0.13, -0.01)	-0.12 (-0.18, -0.07)	-0.06 (-0.11, -0.01)	-0.10 (-0.15, -0.05)
	Polyunsaturated fatty acids	0.03 (-0.03, 0.09)	0.02 (-0.04, 0.08)	0.04 (-0.02, 0.10)	-0.02 (-0.07, 0.04)	0.03 (-0.03, 0.09)	0.03 (-0.03, 0.08)
	Polyunsaturated:total FAs	0.06 (0.00, 0.12)	0.08 (0.02, 0.14)	0.06 (0.00, 0.12)	0.11 (0.05, 0.17)	0.06 (0.00, 0.11)	0.08 (0.03, 0.14)
	Omega3 fatty acids	0.04 (-0.02, 0.10)	0.04 (-0.02, 0.10)	0.07 (0.00, 0.13)	0.01 (-0.05, 0.07)	0.06 (0.00, 0.12)	0.03 (-0.02, 0.09)
	Omega3:total FAs	0.06 (0.00, 0.12)	0.08 (0.02, 0.14)	0.09 (0.03, 0.15)	0.08 (0.02, 0.14)	0.09 (0.04, 0.15)	0.08 (0.02, 0.13)
	22:6, docosahexaenoic acid	0.03 (-0.03, 0.09)	0.05 (-0.01, 0.11)	0.08 (0.02, 0.14)	0.06 (0.00, 0.11)	0.08 (0.03, 0.14)	0.04 (-0.02, 0.09)

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	Docosahexaenoic:total FAs	0.03 (-0.03, 0.09)	0.06 (0.01, 0.12)	0.08 (0.02, 0.14)	0.10 (0.04, 0.16)	0.10 (0.05, 0.15)	0.07 (0.01, 0.12)
	Omega6 fatty acids	0.03 (-0.03, 0.09)	0.01 (-0.05, 0.07)	0.03 (-0.03, 0.10)	-0.02 (-0.08, 0.04)	0.02 (-0.03, 0.08)	0.03 (-0.03, 0.08)
	Omega6:total FAs	0.05 (-0.01, 0.11)	0.07 (0.01, 0.13)	0.04 (-0.02, 0.10)	0.10 (0.05, 0.16)	0.04 (-0.01, 0.09)	0.07 (0.02, 0.13)
	18:2, linoleic acid	0.03 (-0.03, 0.09)	0.01 (-0.05, 0.07)	0.02 (-0.04, 0.08)	-0.03 (-0.08, 0.03)	0.01 (-0.05, 0.06)	0.02 (-0.03, 0.08)
	Linoleic:total FAs	0.05 (-0.01, 0.11)	0.06 (0.00, 0.11)	0.02 (-0.04, 0.08)	0.07 (0.02, 0.13)	0.01 (-0.04, 0.07)	0.05 (0.00, 0.11)
	Total cholines	0.00 (-0.06, 0.06)	-0.01 (-0.07, 0.05)	0.04 (-0.03, 0.10)	-0.03 (-0.08, 0.03)	0.06 (0.00, 0.11)	0.05 (-0.01, 0.10)
	Phosphatidylcholine	-0.01 (-0.08, 0.05)	-0.03 (-0.09, 0.03)	0.02 (-0.05, 0.08)	-0.05 (-0.10, 0.01)	0.06 (0.00, 0.11)	0.04 (-0.02, 0.09)
	Sphingomyelins	0.03 (-0.03, 0.09)	0.03 (-0.03, 0.09)	0.07 (0.01, 0.13)	0.04 (-0.02, 0.10)	0.04 (-0.01, 0.10)	0.05 (-0.01, 0.10)
Other	ApoA1	0.01 (-0.05, 0.07)	0.02 (-0.04, 0.08)	0.05 (-0.01, 0.11)	0.02 (-0.04, 0.07)	0.06 (0.01, 0.11)	0.06 (0.01, 0.11)
	ApoB	0.00 (-0.06, 0.06)	-0.03 (-0.09, 0.03)	0.00 (-0.06, 0.06)	-0.06 (-0.12, 0.00)	-0.01 (-0.06, 0.05)	-0.03 (-0.08, 0.03)
	ApoB:ApoA1	-0.01 (-0.07, 0.05)	-0.04 (-0.10, 0.01)	-0.02 (-0.08, 0.04)	-0.07 (-0.13, -0.02)	-0.04 (-0.08, 0.01)	-0.05 (-0.10, 0.00)
	Pyruvate	-0.05 (-0.11, 0.01)	-0.09 (-0.15, -0.03)	-0.05 (-0.11, 0.01)	-0.06 (-0.12, 0.00)	-0.05 (-0.11, 0.00)	-0.05 (-0.10, 0.01)
	Citrate	0.01 (-0.05, 0.07)	0.01 (-0.04, 0.07)	0.03 (-0.04, 0.09)	0.03 (-0.03, 0.09)	-0.02 (-0.08, 0.04)	0.00 (-0.05, 0.06)
	Glycerol	0.06 (-0.04, 0.15)	0.03 (-0.06, 0.12)	0.05 (-0.04, 0.14)	-0.01 (-0.11, 0.08)	-0.02 (-0.10, 0.05)	-0.03 (-0.11, 0.04)
	Acetate	0.04 (-0.02, 0.10)	0.00 (-0.06, 0.06)	0.02 (-0.04, 0.09)	0.04 (-0.02, 0.10)	-0.05 (-0.11, 0.00)	-0.06 (-0.12, 0.00)
	Acetoacetate	0.01 (-0.05, 0.07)	0.05 (-0.01, 0.11)	0.02 (-0.04, 0.08)	0.03 (-0.03, 0.09)	-0.01 (-0.07, 0.05)	-0.04 (-0.09, 0.02)
	3hydroxybutyrate	0.02 (-0.05, 0.08)	0.05 (-0.01, 0.11)	0.04 (-0.02, 0.10)	0.05 (-0.01, 0.11)	-0.03 (-0.09, 0.02)	-0.05 (-0.11, 0.01)
	Alanine	-0.04 (-0.11, 0.02)	-0.08 (-0.14, -0.02)	-0.02 (-0.08, 0.04)	-0.06 (-0.12, 0.00)	0.02 (-0.04, 0.07)	0.02 (-0.03, 0.08)
	Glycine	-0.04 (-0.10, 0.02)	-0.06 (-0.12, -0.01)	-0.04 (-0.10, 0.02)	-0.07 (-0.13, -0.01)	0.00 (-0.05, 0.06)	-0.02 (-0.08, 0.03)
	Isoleucine	-0.01 (-0.08, 0.05)	-0.07 (-0.13, -0.02)	-0.03 (-0.09, 0.03)	-0.07 (-0.13, -0.01)	-0.02 (-0.07, 0.03)	-0.02 (-0.07, 0.03)
	Leucine	0.00 (-0.06, 0.06)	-0.05 (-0.11, 0.01)	-0.01 (-0.07, 0.05)	-0.06 (-0.12, 0.00)	0.00 (-0.05, 0.05)	0.00 (-0.05, 0.05)
	Valine	0.02 (-0.04, 0.08)	-0.04 (-0.10, 0.02)	0.01 (-0.05, 0.07)	-0.01 (-0.07, 0.05)	0.03 (-0.03, 0.08)	0.03 (-0.02, 0.08)
	Glutamine	0.03 (-0.03, 0.09)	0.02 (-0.04, 0.08)	0.02 (-0.04, 0.08)	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.06)	0.00 (-0.06, 0.05)
	Histidine	0.01 (-0.05, 0.07)	-0.03 (-0.09, 0.03)	0.00 (-0.06, 0.07)	0.00 (-0.06, 0.06)	0.04 (-0.02, 0.09)	0.02 (-0.03, 0.08)
	Phenylalanine	-0.07 (-0.13, -0.01)	-0.10 (-0.16, -0.04)	-0.04 (-0.10, 0.02)	-0.07 (-0.12, -0.01)	0.00 (-0.05, 0.06)	0.01 (-0.05, 0.06)

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Tyrosine	-0.04 (-0.11, 0.02)	-0.10 (-0.16, -0.04)	-0.04 (-0.10, 0.02)	-0.06 (-0.12, 0.00)	0.03 (-0.03, 0.08)	0.02 (-0.03, 0.08)
Creatinine	0.03 (-0.03, 0.09)	0.03 (-0.03, 0.09)	0.04 (-0.03, 0.10)	0.04 (-0.02, 0.10)	0.04 (-0.01, 0.09)	0.03 (-0.02, 0.08)
Albumin	0.03 (-0.03, 0.09)	0.03 (-0.03, 0.09)	0.06 (0.00, 0.12)	0.05 (0.00, 0.11)	0.02 (-0.03, 0.08)	-0.01 (-0.06, 0.05)
GlycA	0.02 (-0.04, 0.07)	-0.05 (-0.10, 0.01)	0.00 (-0.06, 0.05)	-0.08 (-0.14, -0.03)	-0.03 (-0.07, 0.02)	-0.06 (-0.10, -0.01)

xL, extra large; vL, very large; L, large; M, medium; S, small; vS, very small; VLDL, very low density lipoproteins; LDL, low density lipoproteins; IDL, intermediate density lipoproteins; HDL, high density lipoproteins; FAs, fatty acids; ApoA1, Apolipoprotein A1; ApoB, Apolipoprotein B; GlycA, Glycoprotein acetyls.

Table S4. Regression coefficient and 95% confidence interval on original scale for each metabolite per unit increase in mental health score (on a 0-1 scale), for unadjusted regression, and adjusted for age, sex, SEP, and BMI (for adults) or BMI CDC z-score (for children).

		<i>Unadjusted coefficient (95% CI)</i>					
Group	Metabolite	Child				Adult	
		CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.05 (-0.21, 0.31)	0.11 (-0.15, 0.38)	0.31 (0.02, 0.59)	0.12 (-0.15, 0.39)	0.51 (0.02, 1.00)	0.22 (-0.05, 0.48)
	Remnant cholesterol	-0.02 (-0.13, 0.09)	-0.07 (-0.18, 0.04)	-0.03 (-0.15, 0.08)	-0.15 (-0.26, -0.03)	-0.12 (-0.35, 0.11)	-0.14 (-0.27, -0.02)
	Esterified cholesterol	0.03 (-0.16, 0.22)	0.06 (-0.13, 0.25)	0.20 (-0.01, 0.41)	0.07 (-0.12, 0.27)	0.36 (0.01, 0.71)	0.16 (-0.03, 0.35)
	Free cholesterol	0.02 (-0.05, 0.10)	0.05 (-0.03, 0.13)	0.10 (0.02, 0.19)	0.05 (-0.03, 0.13)	0.15 (0.00, 0.29)	0.06 (-0.01, 0.14)
	Total triglycerides	-0.07 (-0.26, 0.12)	-0.26 (-0.45, -0.06)	-0.30 (-0.51, -0.10)	-0.51 (-0.70, -0.32)	-0.59 (-1.00, -0.18)	-0.51 (-0.73, -0.29)
	Total phosphoglycerides	-0.02 (-0.13, 0.08)	-0.03 (-0.14, 0.07)	0.04 (-0.07, 0.15)	-0.08 (-0.18, 0.03)	0.21 (0.01, 0.42)	0.07 (-0.04, 0.18)
	VLDL diameter	-0.21 (-0.86, 0.43)	-0.78 (-1.43, -0.12)	-1.25 (-1.96, -0.55)	-1.50 (-2.16, -0.83)	-1.95 (-2.95, -0.95)	-1.44 (-1.98, -0.91)
	xL VLDL lipids	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.01)	-0.02 (-0.04, -0.01)	-0.03 (-0.05, -0.02)	-0.03 (-0.06, -0.01)	-0.03 (-0.04, -0.01)
	vL VLDL lipids	-0.02 (-0.05, 0.01)	-0.04 (-0.07, -0.01)	-0.05 (-0.08, -0.02)	-0.08 (-0.11, -0.05)	-0.09 (-0.15, -0.03)	-0.07 (-0.10, -0.04)
	L VLDL lipids	-0.04 (-0.12, 0.05)	-0.12 (-0.21, -0.03)	-0.14 (-0.24, -0.05)	-0.23 (-0.32, -0.14)	-0.27 (-0.45, -0.09)	-0.22 (-0.32, -0.13)
	M VLDL lipids	-0.04 (-0.15, 0.07)	-0.15 (-0.26, -0.04)	-0.18 (-0.29, -0.06)	-0.28 (-0.40, -0.17)	-0.34 (-0.58, -0.10)	-0.29 (-0.42, -0.16)
	S VLDL lipids	-0.01 (-0.07, 0.05)	-0.07 (-0.14, -0.01)	-0.08 (-0.14, -0.01)	-0.14 (-0.20, -0.08)	-0.16 (-0.30, -0.03)	-0.15 (-0.22, -0.08)
	vS VLDL lipids	0.01 (-0.02, 0.04)	0.00 (-0.03, 0.03)	0.01 (-0.02, 0.05)	-0.00 (-0.03, 0.03)	-0.01 (-0.08, 0.05)	-0.03 (-0.06, 0.01)
	VLDL cholesterol	-0.03 (-0.10, 0.05)	-0.09 (-0.17, -0.01)	-0.08 (-0.17, -0.00)	-0.17 (-0.25, -0.09)	-0.17 (-0.34, -0.01)	-0.16 (-0.25, -0.07)
	VLDL triglycerides	-0.06 (-0.24, 0.11)	-0.25 (-0.43, -0.07)	-0.30 (-0.49, -0.11)	-0.47 (-0.65, -0.29)	-0.57 (-0.95, -0.19)	-0.48 (-0.68, -0.28)
	LDL diameter	-0.01 (-0.05, 0.03)	0.03 (-0.01, 0.08)	0.02 (-0.03, 0.07)	0.02 (-0.02, 0.07)	-0.05 (-0.11, 0.01)	0.00 (-0.03, 0.04)
	L LDL lipids	0.02 (-0.08, 0.11)	0.03 (-0.06, 0.13)	0.09 (-0.02, 0.19)	0.05 (-0.05, 0.15)	0.10 (-0.07, 0.28)	0.03 (-0.07, 0.12)
	M LDL lipids	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.07)	0.05 (-0.01, 0.11)	0.03 (-0.03, 0.09)	0.06 (-0.05, 0.17)	0.01 (-0.04, 0.07)
	S LDL lipids	0.01 (-0.03, 0.04)	0.01 (-0.03, 0.04)	0.03 (-0.01, 0.07)	0.02 (-0.02, 0.06)	0.04 (-0.02, 0.11)	0.01 (-0.02, 0.05)
	LDL cholesterol	0.03 (-0.11, 0.16)	0.04 (-0.11, 0.18)	0.12 (-0.03, 0.28)	0.08 (-0.06, 0.22)	0.18 (-0.08, 0.44)	0.06 (-0.08, 0.20)

	LDL triglycerides	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.02)	-0.01 (-0.02, 0.00)	0.00 (-0.03, 0.03)	-0.01 (-0.02, 0.01)
	IDL lipids	0.01 (-0.07, 0.08)	0.03 (-0.05, 0.11)	0.07 (-0.01, 0.15)	0.03 (-0.05, 0.11)	0.07 (-0.07, 0.21)	0.02 (-0.05, 0.10)
	IDL cholesterol	0.01 (-0.04, 0.06)	0.02 (-0.03, 0.08)	0.05 (-0.01, 0.11)	0.03 (-0.02, 0.08)	0.05 (-0.05, 0.15)	0.02 (-0.03, 0.07)
	IDL triglycerides	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.00)	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.00)
	HDL diameter	-0.01 (-0.10, 0.09)	0.11 (0.01, 0.20)	0.16 (0.06, 0.27)	0.14 (0.04, 0.24)	0.27 (0.10, 0.43)	0.22 (0.13, 0.30)
	vL HDL lipids	-0.01 (-0.09, 0.07)	0.08 (-0.00, 0.16)	0.14 (0.05, 0.22)	0.09 (0.01, 0.17)	0.23 (0.09, 0.38)	0.17 (0.10, 0.25)
	L HDL lipids	0.04 (-0.08, 0.15)	0.16 (0.04, 0.28)	0.23 (0.11, 0.36)	0.20 (0.08, 0.32)	0.45 (0.21, 0.69)	0.32 (0.19, 0.45)
	M HDL lipids	0.04 (-0.01, 0.10)	0.05 (-0.01, 0.10)	0.04 (-0.02, 0.10)	0.04 (-0.01, 0.10)	0.09 (-0.02, 0.20)	0.06 (0.00, 0.12)
	S HDL lipids	0.06 (0.01, 0.10)	0.03 (-0.02, 0.08)	0.00 (-0.05, 0.05)	0.02 (-0.03, 0.07)	0.01 (-0.07, 0.10)	-0.01 (-0.06, 0.04)
	HDL1 cholesterol	0.05 (-0.06, 0.16)	0.14 (0.03, 0.26)	0.22 (0.10, 0.34)	0.19 (0.07, 0.30)	0.45 (0.22, 0.68)	0.30 (0.18, 0.42)
	HDL2 cholesterol	0.05 (-0.06, 0.15)	0.14 (0.03, 0.24)	0.20 (0.09, 0.32)	0.18 (0.07, 0.29)	0.41 (0.20, 0.62)	0.28 (0.17, 0.39)
	HDL3 cholesterol	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.02)	0.02 (0.01, 0.03)	0.01 (-0.00, 0.02)	0.04 (0.02, 0.06)	0.02 (0.01, 0.03)
	HDL triglycerides	-0.00 (-0.02, 0.01)	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.01)	-0.02 (-0.04, -0.01)	-0.01 (-0.04, 0.01)	-0.01 (-0.03, 0.00)
Fatty Acids and Cholines	Total fatty acids	-0.11 (-0.79, 0.57)	-0.47 (-1.16, 0.22)	-0.26 (-1.00, 0.48)	-1.19 (-1.89, -0.49)	-0.77 (-2.20, 0.67)	-0.86 (-1.63, -0.09)
	Saturated fatty acids	-0.13 (-0.39, 0.13)	-0.22 (-0.49, 0.04)	-0.13 (-0.42, 0.15)	-0.50 (-0.77, -0.22)	-0.33 (-0.89, 0.23)	-0.34 (-0.64, -0.04)
	Saturated:total FAs	-0.75 (-1.46, -0.03)	-0.32 (-1.06, 0.41)	-0.17 (-0.96, 0.63)	-0.42 (-1.16, 0.33)	-0.28 (-1.46, 0.90)	-0.04 (-0.67, 0.60)
	Degree of unsaturation	0.02 (-0.01, 0.04)	0.03 (0.00, 0.05)	0.04 (0.01, 0.07)	0.06 (0.03, 0.08)	0.10 (0.06, 0.14)	0.06 (0.04, 0.08)
	Monounsaturated fatty acids	-0.11 (-0.37, 0.14)	-0.35 (-0.61, -0.09)	-0.30 (-0.58, -0.02)	-0.65 (-0.92, -0.39)	-0.63 (-1.18, -0.07)	-0.58 (-0.88, -0.28)
	Monounsaturated:total FAs	-0.71 (-1.78, 0.35)	-2.01 (-3.10, -0.93)	-2.20 (-3.36, -1.04)	-3.02 (-4.11, -1.92)	-3.63 (-5.36, -1.90)	-3.06 (-3.99, -2.14)
	Polyunsaturated fatty acids	0.13 (-0.10, 0.36)	0.10 (-0.13, 0.34)	0.17 (-0.08, 0.43)	-0.04 (-0.28, 0.19)	0.19 (-0.23, 0.62)	0.07 (-0.16, 0.30)
	Polyunsaturated:total FAs	1.46 (0.10, 2.83)	2.34 (0.94, 3.73)	2.36 (0.86, 3.86)	3.44 (2.03, 4.84)	3.91 (1.74, 6.07)	3.10 (1.94, 4.26)
	Omega3 fatty acids	0.02 (-0.01, 0.06)	0.02 (-0.01, 0.06)	0.04 (0.00, 0.08)	0.00 (-0.03, 0.04)	0.09 (0.01, 0.16)	0.03 (-0.01, 0.07)
	Omega3:total FAs	0.23 (-0.01, 0.48)	0.35 (0.10, 0.60)	0.44 (0.17, 0.71)	0.41 (0.16, 0.66)	0.99 (0.57, 1.41)	0.54 (0.31, 0.76)
	22:6, docosahexaenoic acid	0.01 (-0.01, 0.02)	0.01 (0.00, 0.02)	0.02 (0.01, 0.03)	0.01 (0.00, 0.03)	0.05 (0.02, 0.07)	0.02 (0.00, 0.03)
	Docosahexaenoic:total FAs	0.05 (-0.05, 0.15)	0.15 (0.04, 0.26)	0.21 (0.09, 0.32)	0.22 (0.12, 0.33)	0.45 (0.28, 0.62)	0.22 (0.13, 0.32)

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	Omega6 fatty acids	0.11 (-0.09, 0.31)	0.08 (-0.12, 0.28)	0.14 (-0.09, 0.36)	-0.05 (-0.25, 0.16)	0.11 (-0.26, 0.47)	0.04 (-0.16, 0.24)
	Omega6:total FAs	1.23 (-0.04, 2.50)	1.99 (0.69, 3.28)	1.93 (0.53, 3.32)	3.03 (1.72, 4.34)	2.92 (0.89, 4.94)	2.56 (1.48, 3.65)
	18:2, linoleic acid	0.10 (-0.08, 0.29)	0.08 (-0.12, 0.27)	0.09 (-0.12, 0.30)	-0.05 (-0.25, 0.14)	0.03 (-0.31, 0.37)	0.03 (-0.15, 0.21)
	Linoleic:total FAs	1.19 (-0.14, 2.52)	1.80 (0.45, 3.15)	1.46 (0.00, 2.92)	2.46 (1.09, 3.82)	1.88 (-0.18, 3.94)	2.04 (0.94, 3.15)
	Total cholines	-0.00 (-0.11, 0.11)	0.01 (-0.10, 0.12)	0.10 (-0.02, 0.21)	-0.02 (-0.13, 0.09)	0.25 (0.05, 0.46)	0.12 (0.00, 0.23)
	Phosphatidylcholine	-0.02 (-0.12, 0.08)	-0.02 (-0.13, 0.08)	0.05 (-0.07, 0.16)	-0.06 (-0.17, 0.04)	0.21 (0.01, 0.41)	0.08 (-0.03, 0.19)
	Sphingomyelins	0.01 (-0.01, 0.04)	0.03 (-0.00, 0.05)	0.05 (0.02, 0.07)	0.03 (0.00, 0.06)	0.05 (0.00, 0.10)	0.03 (0.00, 0.05)
Other	ApoA1	0.02 (-0.04, 0.09)	0.05 (-0.01, 0.12)	0.11 (0.04, 0.18)	0.06 (-0.00, 0.13)	0.22 (0.10, 0.35)	0.13 (0.07, 0.20)
	ApoB	-0.01 (-0.06, 0.05)	-0.04 (-0.09, 0.02)	-0.03 (-0.09, 0.03)	-0.08 (-0.14, -0.02)	-0.07 (-0.19, 0.05)	-0.08 (-0.15, -0.02)
	ApoB:ApoA1	-0.01 (-0.05, 0.03)	-0.05 (-0.09, -0.00)	-0.05 (-0.09, -0.01)	-0.08 (-0.12, -0.04)	-0.11 (-0.20, -0.03)	-0.10 (-0.14, -0.05)
	Pyruvate	-0.01 (-0.02, 0.00)	-0.02 (-0.03, -0.01)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, -0.00)	-0.03 (-0.05, -0.01)	-0.02 (-0.03, -0.01)
	Citrate	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.01 (-0.00, 0.02)	0.01 (-0.00, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)
	Glycerol	0.01 (-0.00, 0.02)	0.00 (-0.01, 0.02)	0.00 (-0.02, 0.02)	-0.01 (-0.02, 0.01)	-0.02 (-0.04, -0.00)	-0.02 (-0.03, -0.01)
	Acetate	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	-0.02 (-0.04, 0.00)	-0.01 (-0.02, 0.00)
	Acetoacetate	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.00)
	3hydroxybutyrate	0.01 (-0.03, 0.05)	0.04 (-0.00, 0.08)	0.04 (-0.00, 0.08)	0.04 (-0.00, 0.08)	-0.02 (-0.08, 0.03)	-0.02 (-0.05, 0.01)
	Alanine	-0.02 (-0.04, 0.01)	-0.03 (-0.06, -0.01)	-0.01 (-0.04, 0.02)	-0.03 (-0.05, -0.00)	0.01 (-0.03, 0.04)	0.00 (-0.02, 0.02)
	Glycine	-0.01 (-0.02, 0.00)	-0.01 (-0.03, 0.00)	-0.01 (-0.02, 0.01)	-0.01 (-0.03, -0.00)	0.00 (-0.03, 0.04)	-0.01 (-0.03, 0.01)
	Isoleucine	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)	-0.01 (-0.02, -0.00)	-0.01 (-0.02, -0.01)	-0.01 (-0.02, 0.00)	-0.01 (-0.01, -0.00)
	Leucine	-0.00 (-0.01, 0.01)	-0.01 (-0.02, -0.00)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, -0.00)	-0.00 (-0.02, 0.01)	-0.00 (-0.01, 0.00)
	Valine	0.00 (-0.01, 0.02)	-0.01 (-0.03, 0.00)	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.00)	0.01 (-0.02, 0.03)	0.00 (-0.01, 0.02)
	Glutamine	0.01 (-0.01, 0.04)	0.02 (-0.00, 0.04)	0.02 (-0.00, 0.04)	0.02 (-0.01, 0.04)	0.04 (-0.00, 0.07)	0.02 (-0.00, 0.04)
	Histidine	0.00 (-0.00, 0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)	0.01 (0.00, 0.01)	0.00 (-0.00, 0.01)
	Phenylalanine	-0.00 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.01, 0.00)	-0.00 (-0.01, -0.00)
	Tyrosine	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)	-0.01 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)

	Creatinine	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.01 (0.00, 0.01)	0.00 (0.00, 0.01)
	Albumin	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.01)	0.00 (-0.00, 0.00)
	GlycA	0.01 (-0.07, 0.08)	-0.10 (-0.17, -0.02)	-0.09 (-0.17, -0.01)	-0.17 (-0.25, -0.09)	-0.25 (-0.39, -0.10)	-0.22 (-0.30, -0.14)
<i>Adjusted coefficient (95% CI)</i>							
		Child				Adult	
Group	Metabolite	CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.04 (-0.22, 0.30)	0.04 (-0.23, 0.31)	0.24 (-0.05, 0.53)	0.06 (-0.22, 0.33)	0.44 (-0.06, 0.93)	0.20 (-0.07, 0.47)
	Remnant cholesterol	-0.01 (-0.12, 0.09)	-0.06 (-0.17, 0.05)	0.02 (-0.10, 0.14)	-0.11 (-0.22, 0.00)	-0.01 (-0.23, 0.21)	-0.04 (-0.16, 0.08)
	Esterified cholesterol	0.02 (-0.17, 0.21)	0.01 (-0.19, 0.20)	0.16 (-0.05, 0.37)	0.03 (-0.17, 0.23)	0.31 (-0.05, 0.67)	0.15 (-0.05, 0.34)
	Free cholesterol	0.02 (-0.06, 0.09)	0.03 (-0.05, 0.10)	0.08 (-0.01, 0.16)	0.03 (-0.05, 0.11)	0.12 (-0.02, 0.27)	0.06 (-0.02, 0.13)
	Total triglycerides	-0.05 (-0.23, 0.14)	-0.19 (-0.38, -0.01)	-0.15 (-0.35, 0.05)	-0.40 (-0.59, -0.21)	-0.31 (-0.69, 0.07)	-0.27 (-0.48, -0.06)
	Total phosphoglycerides	-0.03 (-0.13, 0.07)	-0.06 (-0.16, 0.05)	0.03 (-0.09, 0.14)	-0.10 (-0.20, 0.01)	0.19 (-0.02, 0.40)	0.07 (-0.05, 0.18)
	VLDL diameter	-0.15 (-0.78, 0.48)	-0.54 (-1.20, 0.11)	-0.78 (-1.48, -0.08)	-1.14 (-1.80, -0.48)	-1.17 (-2.07, -0.28)	-0.82 (-1.31, -0.33)
	xL VLDL lipids	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.00)	-0.01 (-0.03, 0.00)	-0.03 (-0.04, -0.01)	-0.02 (-0.05, 0.00)	-0.02 (-0.03, -0.00)
	vL VLDL lipids	-0.01 (-0.04, 0.02)	-0.04 (-0.07, -0.01)	-0.03 (-0.06, 0.00)	-0.06 (-0.09, -0.03)	-0.05 (-0.11, 0.00)	-0.04 (-0.07, -0.01)
	L VLDL lipids	-0.03 (-0.11, 0.06)	-0.09 (-0.18, -0.01)	-0.07 (-0.16, 0.02)	-0.18 (-0.27, -0.09)	-0.15 (-0.32, 0.02)	-0.12 (-0.21, -0.03)
	M VLDL lipids	-0.02 (-0.13, 0.08)	-0.11 (-0.22, 0.00)	-0.08 (-0.20, 0.03)	-0.22 (-0.33, -0.10)	-0.18 (-0.40, 0.04)	-0.16 (-0.27, -0.04)
	S VLDL lipids	-0.00 (-0.06, 0.05)	-0.05 (-0.11, 0.01)	-0.03 (-0.09, 0.03)	-0.10 (-0.16, -0.04)	-0.07 (-0.19, 0.05)	-0.07 (-0.14, -0.00)
	vS VLDL lipids	0.01 (-0.02, 0.04)	0.00 (-0.03, 0.03)	0.02 (-0.01, 0.06)	0.00 (-0.03, 0.04)	0.02 (-0.05, 0.08)	-0.00 (-0.04, 0.03)
	VLDL cholesterol	-0.02 (-0.09, 0.06)	-0.07 (-0.14, 0.01)	-0.03 (-0.11, 0.05)	-0.13 (-0.20, -0.05)	-0.07 (-0.22, 0.09)	-0.07 (-0.16, 0.01)
	VLDL triglycerides	-0.04 (-0.21, 0.13)	-0.18 (-0.36, -0.01)	-0.15 (-0.34, 0.03)	-0.36 (-0.54, -0.19)	-0.32 (-0.66, 0.03)	-0.27 (-0.45, -0.08)
	LDL diameter	-0.01 (-0.05, 0.03)	0.02 (-0.02, 0.07)	0.01 (-0.04, 0.06)	0.01 (-0.03, 0.06)	-0.03 (-0.09, 0.03)	0.01 (-0.02, 0.04)
	L LDL lipids	0.02 (-0.08, 0.11)	0.02 (-0.08, 0.11)	0.08 (-0.03, 0.18)	0.04 (-0.06, 0.14)	0.11 (-0.07, 0.29)	0.05 (-0.05, 0.15)
	M LDL lipids	0.01 (-0.05, 0.07)	0.01 (-0.05, 0.06)	0.05 (-0.02, 0.11)	0.02 (-0.04, 0.09)	0.07 (-0.04, 0.18)	0.03 (-0.03, 0.09)
S LDL lipids	0.01 (-0.03, 0.04)	0.00 (-0.03, 0.04)	0.03 (-0.01, 0.07)	0.02 (-0.02, 0.05)	0.05 (-0.02, 0.11)	0.02 (-0.02, 0.06)	

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	LDL cholesterol	0.02 (-0.11, 0.16)	0.01 (-0.13, 0.16)	0.11 (-0.04, 0.27)	0.07 (-0.08, 0.21)	0.18 (-0.09, 0.44)	0.08 (-0.07, 0.23)
	LDL triglycerides	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.02)	-0.01 (-0.02, -0.00)	0.01 (-0.02, 0.03)	-0.00 (-0.02, 0.01)
	IDL lipids	0.01 (-0.07, 0.08)	0.01 (-0.06, 0.09)	0.06 (-0.02, 0.15)	0.02 (-0.06, 0.10)	0.09 (-0.06, 0.23)	0.04 (-0.04, 0.12)
	IDL cholesterol	0.01 (-0.05, 0.06)	0.01 (-0.04, 0.07)	0.05 (-0.01, 0.10)	0.02 (-0.03, 0.08)	0.06 (-0.04, 0.16)	0.03 (-0.02, 0.09)
	IDL triglycerides	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.00)	0.00 (-0.02, 0.02)	-0.00 (-0.01, 0.01)
	HDL diameter	-0.02 (-0.11, 0.07)	0.05 (-0.04, 0.14)	0.07 (-0.03, 0.17)	0.06 (-0.03, 0.16)	0.12 (-0.02, 0.27)	0.10 (0.03, 0.18)
	vL HDL lipids	-0.02 (-0.10, 0.05)	0.03 (-0.04, 0.11)	0.07 (-0.02, 0.15)	0.03 (-0.05, 0.11)	0.11 (-0.01, 0.24)	0.09 (0.02, 0.16)
	L HDL lipids	0.01 (-0.10, 0.12)	0.09 (-0.03, 0.20)	0.11 (-0.01, 0.23)	0.10 (-0.01, 0.22)	0.25 (0.04, 0.46)	0.17 (0.05, 0.28)
	M HDL lipids	0.04 (-0.01, 0.09)	0.04 (-0.02, 0.09)	0.02 (-0.04, 0.08)	0.03 (-0.02, 0.09)	0.08 (-0.02, 0.19)	0.05 (-0.01, 0.11)
	S HDL lipids	0.06 (0.01, 0.10)	0.04 (-0.01, 0.09)	0.01 (-0.04, 0.06)	0.03 (-0.02, 0.07)	0.05 (-0.04, 0.13)	0.01 (-0.04, 0.06)
	HDL1 cholesterol	0.03 (-0.08, 0.13)	0.08 (-0.03, 0.19)	0.11 (-0.01, 0.23)	0.10 (-0.01, 0.21)	0.27 (0.07, 0.47)	0.16 (0.05, 0.27)
	HDL2 cholesterol	0.03 (-0.07, 0.13)	0.08 (-0.02, 0.18)	0.10 (-0.01, 0.21)	0.10 (-0.01, 0.20)	0.24 (0.06, 0.43)	0.15 (0.05, 0.25)
	HDL3 cholesterol	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.02)	0.01 (-0.00, 0.02)	0.00 (-0.01, 0.01)	0.03 (0.01, 0.05)	0.01 (0.00, 0.02)
	HDL triglycerides	-0.00 (-0.02, 0.01)	-0.01 (-0.02, 0.00)	-0.00 (-0.02, 0.01)	-0.02 (-0.03, -0.01)	-0.00 (-0.03, 0.02)	-0.00 (-0.02, 0.01)
Fatty Acids and Cholines	Total fatty acids	-0.08 (-0.75, 0.59)	-0.43 (-1.13, 0.26)	0.01 (-0.74, 0.75)	-1.03 (-1.73, -0.33)	-0.13 (-1.55, 1.29)	-0.28 (-1.06, 0.49)
	Saturated fatty acids	-0.12 (-0.38, 0.14)	-0.21 (-0.48, 0.06)	-0.02 (-0.31, 0.27)	-0.43 (-0.70, -0.16)	-0.10 (-0.65, 0.46)	-0.13 (-0.44, 0.17)
	Saturated:total FAs	-0.77 (-1.49, -0.06)	-0.33 (-1.08, 0.41)	-0.07 (-0.87, 0.74)	-0.37 (-1.12, 0.38)	-0.28 (-1.49, 0.92)	-0.07 (-0.73, 0.58)
	Degree of unsaturation	0.02 (-0.01, 0.04)	0.03 (0.00, 0.05)	0.03 (0.00, 0.06)	0.05 (0.02, 0.07)	0.07 (0.03, 0.11)	0.03 (0.01, 0.05)
	Monounsaturated fatty acids	-0.09 (-0.33, 0.16)	-0.29 (-0.55, -0.03)	-0.14 (-0.41, 0.14)	-0.54 (-0.80, -0.28)	-0.26 (-0.80, 0.28)	-0.28 (-0.57, 0.02)
	Monounsaturated:total FAs	-0.54 (-1.57, 0.49)	-1.54 (-2.61, -0.47)	-1.33 (-2.48, -0.18)	-2.35 (-3.43, -1.27)	-1.91 (-3.49, -0.33)	-1.77 (-2.63, -0.90)
	Polyunsaturated fatty acids	0.13 (-0.10, 0.35)	0.07 (-0.17, 0.30)	0.17 (-0.09, 0.42)	-0.06 (-0.30, 0.18)	0.23 (-0.20, 0.66)	0.13 (-0.11, 0.36)
	Polyunsaturated:total FAs	1.32 (-0.02, 2.65)	1.88 (0.48, 3.27)	1.40 (-0.10, 2.89)	2.73 (1.33, 4.13)	2.19 (0.13, 4.25)	1.84 (0.72, 2.97)
	Omega3 fatty acids	0.02 (-0.01, 0.06)	0.02 (-0.01, 0.06)	0.04 (0.00, 0.08)	0.00 (-0.03, 0.04)	0.08 (0.01, 0.15)	0.03 (-0.01, 0.07)
	Omega3:total FAs	0.23 (-0.01, 0.47)	0.32 (0.07, 0.57)	0.38 (0.11, 0.65)	0.36 (0.11, 0.61)	0.71 (0.29, 1.12)	0.33 (0.11, 0.56)
	22:6, docosahexaenoic acid	0.01 (-0.01, 0.02)	0.01 (-0.00, 0.02)	0.02 (0.00, 0.03)	0.01 (-0.00, 0.02)	0.04 (0.01, 0.06)	0.01 (-0.00, 0.02)

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	Docosahexaenoic:total FAs	0.05 (-0.05, 0.15)	0.12 (0.01, 0.22)	0.16 (0.04, 0.28)	0.18 (0.07, 0.29)	0.30 (0.14, 0.47)	0.11 (0.02, 0.21)
	Omega6 fatty acids	0.10 (-0.09, 0.30)	0.04 (-0.16, 0.25)	0.12 (-0.10, 0.35)	-0.07 (-0.27, 0.14)	0.15 (-0.23, 0.52)	0.10 (-0.10, 0.31)
	Omega6:total FAs	1.08 (-0.16, 2.33)	1.55 (0.26, 2.85)	1.01 (-0.38, 2.40)	2.37 (1.06, 3.67)	1.48 (-0.45, 3.42)	1.51 (0.45, 2.56)
	18:2, linoleic acid	0.09 (-0.09, 0.28)	0.03 (-0.16, 0.23)	0.06 (-0.15, 0.27)	-0.09 (-0.28, 0.11)	0.05 (-0.30, 0.39)	0.08 (-0.11, 0.27)
	Linoleic:total FAs	1.03 (-0.27, 2.33)	1.29 (-0.06, 2.64)	0.46 (-0.99, 1.92)	1.72 (0.36, 3.08)	0.54 (-1.48, 2.56)	1.10 (0.00, 2.21)
	Total cholines	-0.01 (-0.11, 0.10)	-0.03 (-0.13, 0.08)	0.07 (-0.05, 0.19)	-0.05 (-0.16, 0.06)	0.22 (0.01, 0.43)	0.10 (-0.01, 0.21)
	Phosphatidylcholine	-0.02 (-0.13, 0.08)	-0.05 (-0.16, 0.06)	0.03 (-0.09, 0.15)	-0.08 (-0.19, 0.02)	0.20 (-0.00, 0.40)	0.08 (-0.03, 0.18)
	Sphingomyelins	0.01 (-0.01, 0.04)	0.01 (-0.01, 0.04)	0.03 (0.00, 0.06)	0.02 (-0.01, 0.05)	0.04 (-0.01, 0.08)	0.02 (-0.00, 0.05)
Other	ApoA1	0.01 (-0.05, 0.07)	0.02 (-0.04, 0.08)	0.06 (-0.01, 0.13)	0.02 (-0.04, 0.08)	0.14 (0.02, 0.26)	0.07 (0.01, 0.14)
	ApoB	-0.00 (-0.06, 0.05)	-0.03 (-0.09, 0.02)	0.00 (-0.06, 0.06)	-0.06 (-0.12, -0.00)	-0.02 (-0.13, 0.10)	-0.03 (-0.09, 0.03)
	ApoB:ApoA1	-0.01 (-0.05, 0.03)	-0.03 (-0.07, 0.01)	-0.01 (-0.06, 0.03)	-0.05 (-0.09, -0.01)	-0.05 (-0.13, 0.02)	-0.05 (-0.09, -0.00)
	Pyruvate	-0.01 (-0.02, 0.00)	-0.01 (-0.02, -0.00)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, 0.00)	-0.02 (-0.04, 0.00)	-0.01 (-0.02, 0.00)
	Citrate	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)
	Glycerol	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	-0.00 (-0.02, 0.01)	-0.01 (-0.02, 0.01)	-0.00 (-0.01, 0.01)
	Acetate	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	-0.02 (-0.05, 0.00)	-0.01 (-0.03, -0.00)
	Acetoacetate	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.00)
	3hydroxybutyrate	0.01 (-0.03, 0.05)	0.03 (-0.01, 0.07)	0.03 (-0.01, 0.07)	0.03 (-0.01, 0.07)	-0.03 (-0.08, 0.02)	-0.03 (-0.05, 0.00)
	Alanine	-0.02 (-0.04, 0.01)	-0.04 (-0.06, -0.01)	-0.01 (-0.04, 0.02)	-0.03 (-0.05, -0.00)	0.01 (-0.02, 0.05)	0.01 (-0.01, 0.03)
	Glycine	-0.01 (-0.02, 0.00)	-0.01 (-0.03, -0.00)	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.00)	0.00 (-0.03, 0.04)	-0.01 (-0.03, 0.01)
	Isoleucine	-0.00 (-0.01, 0.01)	-0.01 (-0.02, -0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)	-0.00 (-0.02, 0.01)	-0.00 (-0.01, 0.00)
	Leucine	-0.00 (-0.01, 0.01)	-0.01 (-0.01, 0.00)	-0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.00)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)
	Valine	0.01 (-0.01, 0.02)	-0.01 (-0.02, 0.01)	0.00 (-0.01, 0.02)	-0.00 (-0.02, 0.01)	0.01 (-0.01, 0.04)	0.01 (-0.01, 0.02)
	Glutamine	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.03)	0.01 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.01 (-0.03, 0.04)	-0.00 (-0.02, 0.02)
	Histidine	0.00 (-0.00, 0.00)	-0.00 (-0.01, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.00)
	Phenylalanine	-0.00 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, -0.00)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.00)

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Tyrosine	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)
Creatinine	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)
Albumin	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)
GlycA	0.02 (-0.05, 0.09)	-0.06 (-0.13, 0.01)	-0.01 (-0.08, 0.07)	-0.11 (-0.18, -0.03)	-0.06 (-0.19, 0.06)	-0.08 (-0.15, -0.01)

xL, extra large; vL, very large; L, large; M, medium; S, small; vS, very small; VLDL, very low density lipoproteins; LDL, low density lipoproteins; IDL, intermediate density lipoproteins; HDL, high density lipoproteins; FAs, fatty acids; ApoA1, Apolipoprotein A1; ApoB, Apolipoprotein B; GlycA, Glycoprotein acetyls.

Table S5. Regression coefficient and 95% confidence interval on original scale for each metabolite per unit increase in mental health score (on a 0-1 scale), adjusted for age, sex, SEP, BMI CDC z-score and puberty development score, for children only.

		<i>Adjusted coefficient (95% CI)</i>			
Group	Metabolite	CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb
Lipids, Cholesterol and Triglycerides	Total cholesterol	-0.02 (-0.29, 0.25)	-0.10 (-0.38, 0.18)	0.14 (-0.17, 0.45)	-0.02 (-0.30, 0.26)
	Remnant cholesterol	-0.02 (-0.13, 0.09)	-0.09 (-0.21, 0.02)	0.01 (-0.12, 0.13)	-0.13 (-0.25, -0.02)
	Esterified cholesterol	-0.02 (-0.22, 0.17)	-0.09 (-0.29, 0.11)	0.09 (-0.13, 0.31)	-0.03 (-0.23, 0.18)
	Free cholesterol	-0.00 (-0.08, 0.08)	-0.01 (-0.09, 0.07)	0.05 (-0.04, 0.14)	0.01 (-0.07, 0.09)
	Total triglycerides	-0.03 (-0.22, 0.16)	-0.21 (-0.41, -0.01)	-0.13 (-0.34, 0.09)	-0.40 (-0.60, -0.21)
	Total phosphoglycerides	-0.05 (-0.16, 0.06)	-0.11 (-0.22, -0.00)	-0.01 (-0.13, 0.11)	-0.12 (-0.24, -0.01)
	VLDL diameter	0.03 (-0.63, 0.69)	-0.45 (-1.14, 0.25)	-0.56 (-1.31, 0.18)	-1.04 (-1.73, -0.35)
	xL VLDL lipids	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.00)	-0.01 (-0.03, 0.00)	-0.03 (-0.04, -0.01)
	vL VLDL lipids	-0.01 (-0.04, 0.02)	-0.04 (-0.07, -0.01)	-0.02 (-0.06, 0.01)	-0.06 (-0.09, -0.03)
	L VLDL lipids	-0.02 (-0.10, 0.07)	-0.09 (-0.19, -0.00)	-0.06 (-0.16, 0.04)	-0.18 (-0.27, -0.09)
	M VLDL lipids	-0.01 (-0.12, 0.10)	-0.11 (-0.23, 0.00)	-0.06 (-0.19, 0.06)	-0.22 (-0.33, -0.10)
	S VLDL lipids	-0.00 (-0.06, 0.06)	-0.06 (-0.12, 0.00)	-0.02 (-0.09, 0.04)	-0.11 (-0.17, -0.05)
	vS VLDL lipids	0.00 (-0.03, 0.03)	-0.01 (-0.04, 0.02)	0.02 (-0.02, 0.05)	-0.00 (-0.04, 0.03)
	VLDL cholesterol	-0.02 (-0.09, 0.06)	-0.08 (-0.16, -0.00)	-0.02 (-0.11, 0.06)	-0.14 (-0.22, -0.06)
	VLDL triglycerides	-0.02 (-0.20, 0.15)	-0.19 (-0.38, -0.01)	-0.12 (-0.32, 0.07)	-0.36 (-0.55, -0.18)
	LDL diameter	-0.01 (-0.06, 0.03)	0.04 (-0.00, 0.09)	0.02 (-0.03, 0.07)	0.03 (-0.02, 0.08)
	L LDL lipids	-0.00 (-0.10, 0.09)	-0.02 (-0.13, 0.08)	0.05 (-0.06, 0.16)	0.02 (-0.08, 0.12)
	M LDL lipids	0.00 (-0.06, 0.06)	-0.02 (-0.08, 0.04)	0.03 (-0.04, 0.10)	0.01 (-0.05, 0.07)
	S LDL lipids	0.00 (-0.03, 0.04)	-0.01 (-0.05, 0.03)	0.02 (-0.03, 0.06)	0.01 (-0.03, 0.05)
	LDL cholesterol	-0.00 (-0.14, 0.14)	-0.05 (-0.20, 0.11)	0.07 (-0.09, 0.24)	0.03 (-0.12, 0.18)
LDL triglycerides	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.00)	0.00 (-0.01, 0.01)	-0.01 (-0.02, -0.00)	

	IDL lipids	-0.01 (-0.09, 0.07)	-0.02 (-0.10, 0.06)	0.04 (-0.05, 0.13)	0.00 (-0.08, 0.09)
	IDL cholesterol	-0.00 (-0.06, 0.05)	-0.01 (-0.07, 0.05)	0.03 (-0.03, 0.09)	0.01 (-0.05, 0.07)
	IDL triglycerides	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.00)
	HDL diameter	-0.04 (-0.13, 0.06)	0.04 (-0.06, 0.14)	0.05 (-0.06, 0.15)	0.06 (-0.04, 0.16)
	vL HDL lipids	-0.03 (-0.11, 0.05)	0.02 (-0.06, 0.10)	0.05 (-0.04, 0.14)	0.03 (-0.06, 0.11)
	L HDL lipids	-0.01 (-0.12, 0.11)	0.06 (-0.06, 0.18)	0.07 (-0.06, 0.20)	0.09 (-0.02, 0.21)
	M HDL lipids	0.03 (-0.02, 0.08)	0.02 (-0.04, 0.07)	-0.00 (-0.06, 0.06)	0.03 (-0.03, 0.08)
	S HDL lipids	0.05 (0.01, 0.10)	0.03 (-0.02, 0.08)	0.00 (-0.06, 0.06)	0.02 (-0.03, 0.07)
	HDL1 cholesterol	0.00 (-0.11, 0.11)	0.04 (-0.07, 0.16)	0.06 (-0.06, 0.18)	0.08 (-0.03, 0.20)
	HDL2 cholesterol	0.00 (-0.10, 0.11)	0.04 (-0.06, 0.15)	0.06 (-0.06, 0.17)	0.08 (-0.02, 0.19)
	HDL3 cholesterol	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.02)	0.00 (-0.01, 0.01)
	HDL triglycerides	-0.00 (-0.02, 0.01)	-0.01 (-0.02, 0.00)	-0.00 (-0.02, 0.01)	-0.02 (-0.04, -0.01)
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	Total fatty acids	-0.22 (-0.92, 0.47)	-0.75 (-1.48, -0.02)	-0.15 (-0.93, 0.63)	-1.18 (-1.91, -0.46)
	Saturated fatty acids	-0.17 (-0.44, 0.10)	-0.31 (-0.60, -0.03)	-0.07 (-0.37, 0.24)	-0.48 (-0.76, -0.20)
	Saturated:total FAs	-0.74 (-1.50, 0.01)	-0.17 (-0.96, 0.62)	0.08 (-0.78, 0.93)	-0.35 (-1.13, 0.44)
	Degree of unsaturation	0.02 (-0.01, 0.04)	0.02 (-0.00, 0.05)	0.03 (-0.00, 0.05)	0.05 (0.02, 0.07)
	Monounsaturated fatty acids	-0.11 (-0.37, 0.15)	-0.37 (-0.65, -0.10)	-0.15 (-0.44, 0.14)	-0.57 (-0.84, -0.30)
	Monounsaturated:total FAs	-0.31 (-1.40, 0.77)	-1.47 (-2.60, -0.34)	-0.98 (-2.20, 0.24)	-2.19 (-3.33, -1.06)
	Polyunsaturated fatty acids	0.06 (-0.18, 0.29)	-0.06 (-0.31, 0.18)	0.07 (-0.20, 0.33)	-0.13 (-0.37, 0.11)
	Polyunsaturated:total FAs	1.05 (-0.35, 2.46)	1.64 (0.17, 3.11)	0.91 (-0.68, 2.50)	2.54 (1.08, 4.00)
	Omega3 fatty acids	0.01 (-0.02, 0.05)	-0.00 (-0.04, 0.04)	0.03 (-0.01, 0.07)	-0.01 (-0.05, 0.03)
	Omega3:total FAs	0.16 (-0.09, 0.41)	0.19 (-0.07, 0.46)	0.28 (-0.00, 0.57)	0.28 (0.02, 0.55)
	22:6, docosahexaenoic acid	0.00 (-0.01, 0.02)	0.00 (-0.01, 0.02)	0.01 (0.00, 0.03)	0.01 (-0.00, 0.02)
	Docosahexaenoic:total FAs	0.03 (-0.08, 0.14)	0.08 (-0.03, 0.20)	0.13 (0.01, 0.26)	0.16 (0.05, 0.27)
	Omega6 fatty acids	0.04 (-0.16, 0.25)	-0.06 (-0.27, 0.15)	0.04 (-0.19, 0.27)	-0.12 (-0.33, 0.09)
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Fatty Acids and Cholines					

	Omega6:total FAs	0.89 (-0.42, 2.20)	1.45 (0.08, 2.82)	0.62 (-0.85, 2.10)	2.26 (0.90, 3.62)
	18:2, linoleic acid	0.05 (-0.14, 0.24)	-0.05 (-0.25, 0.15)	-0.01 (-0.23, 0.21)	-0.12 (-0.32, 0.08)
	Linoleic:total FAs	0.90 (-0.47, 2.27)	1.26 (-0.17, 2.70)	0.14 (-1.41, 1.69)	1.70 (0.28, 3.13)
	Total cholines	-0.03 (-0.14, 0.08)	-0.08 (-0.20, 0.03)	0.02 (-0.10, 0.15)	-0.08 (-0.20, 0.03)
	Phosphatidylcholine	-0.05 (-0.15, 0.06)	-0.10 (-0.22, 0.01)	-0.01 (-0.13, 0.12)	-0.11 (-0.22, 0.00)
	Sphingomyelins	0.00 (-0.02, 0.03)	0.00 (-0.03, 0.03)	0.02 (-0.01, 0.05)	0.01 (-0.02, 0.04)
	ApoA1	-0.00 (-0.07, 0.06)	-0.01 (-0.07, 0.06)	0.03 (-0.05, 0.10)	0.01 (-0.06, 0.07)
	ApoB	-0.01 (-0.06, 0.05)	-0.05 (-0.11, 0.01)	-0.00 (-0.07, 0.06)	-0.07 (-0.13, -0.01)
	ApoB:ApoA1	-0.01 (-0.05, 0.03)	-0.03 (-0.08, 0.01)	-0.01 (-0.05, 0.04)	-0.05 (-0.10, -0.01)
	Pyruvate	-0.01 (-0.02, 0.00)	-0.02 (-0.03, -0.01)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, -0.00)
	Citrate	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.01, 0.01)
	Glycerol	0.00 (-0.01, 0.02)	0.00 (-0.01, 0.02)	0.01 (-0.01, 0.03)	-0.00 (-0.02, 0.02)
	Acetate	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)
	Acetoacetate	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.02)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)
	3hydroxybutyrate	0.00 (-0.04, 0.04)	0.03 (-0.01, 0.08)	0.03 (-0.01, 0.08)	0.04 (-0.00, 0.08)
Other	Alanine	-0.01 (-0.04, 0.01)	-0.04 (-0.06, -0.01)	-0.00 (-0.03, 0.02)	-0.03 (-0.05, -0.00)
	Glycine	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.00)	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.00)
	Isoleucine	-0.00 (-0.01, 0.01)	-0.01 (-0.02, -0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)
	Leucine	-0.00 (-0.01, 0.01)	-0.01 (-0.01, 0.00)	-0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.00)
	Valine	0.01 (-0.01, 0.02)	-0.01 (-0.02, 0.01)	0.00 (-0.02, 0.02)	-0.00 (-0.02, 0.01)
	Glutamine	0.02 (-0.01, 0.04)	0.01 (-0.01, 0.04)	0.01 (-0.01, 0.03)	0.01 (-0.02, 0.03)
	Histidine	0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)
	Phenylalanine	-0.00 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, -0.00)
	Tyrosine	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.01, 0.00)
	Creatinine	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)

Albumin	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)
GlycA	0.00 (-0.07, 0.08)	-0.07 (-0.15, 0.00)	-0.00 (-0.09, 0.08)	-0.12 (-0.19, -0.04)

xL, extra large; vL, very large; L, large; M, medium; S, small; vS, very small; VLDL, very low density lipoproteins; LDL, low density lipoproteins; IDL, intermediate density lipoproteins; HDL, high density lipoproteins; FAs, fatty acids; ApoA1, Apolipoprotein A1; ApoB, Apolipoprotein B; GlycA, Glycoprotein acetyls.

Table S6. Regression coefficient and 95% confidence interval on original scale for each metabolite per unit increase in mental health score (on a 0-1 scale), stratified by participants reporting mental health conditions, adjusted for age, sex, SEP, and BMI (for adults) or BMI CDC z-score (for children).

		<i>Adjusted coefficient (95% CI) for no reported mental health condition</i>					
Group	Metabolite	Child				Adult	
		CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.03 (-0.25, 0.32)	0.07 (-0.23, 0.37)	0.24 (-0.08, 0.56)	0.09 (-0.22, 0.39)	0.41 (-0.61, 1.43)	0.17 (-0.35, 0.69)
	Remnant cholesterol	-0.02 (-0.14, 0.10)	-0.04 (-0.16, 0.08)	0.03 (-0.10, 0.16)	-0.09 (-0.21, 0.03)	-0.08 (-0.52, 0.36)	-0.01 (-0.24, 0.21)
	Esterified cholesterol	0.02 (-0.19, 0.22)	0.04 (-0.18, 0.25)	0.16 (-0.07, 0.39)	0.05 (-0.16, 0.27)	0.29 (-0.45, 1.03)	0.14 (-0.24, 0.52)
	Free cholesterol	0.01 (-0.07, 0.10)	0.03 (-0.05, 0.12)	0.07 (-0.02, 0.16)	0.03 (-0.05, 0.12)	0.10 (-0.20, 0.40)	0.02 (-0.14, 0.17)
	Total triglycerides	-0.06 (-0.26, 0.13)	-0.16 (-0.36, 0.05)	-0.11 (-0.33, 0.10)	-0.37 (-0.57, -0.17)	-0.38 (-1.12, 0.36)	-0.23 (-0.61, 0.15)
	Total phosphoglycerides	-0.01 (-0.11, 0.10)	-0.01 (-0.12, 0.10)	0.07 (-0.05, 0.19)	-0.04 (-0.15, 0.07)	0.17 (-0.27, 0.61)	-0.00 (-0.23, 0.22)
	VLDL diameter	-0.11 (-0.79, 0.58)	-0.44 (-1.16, 0.28)	-0.61 (-1.37, 0.15)	-0.98 (-1.70, -0.27)	-1.99 (-3.80, -0.18)	-1.01 (-1.93, -0.08)
	xL VLDL lipids	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.00)	-0.01 (-0.02, 0.01)	-0.03 (-0.04, -0.01)	-0.03 (-0.08, 0.01)	-0.02 (-0.04, 0.01)
	vL VLDL lipids	-0.01 (-0.04, 0.02)	-0.03 (-0.06, 0.00)	-0.02 (-0.05, 0.01)	-0.06 (-0.09, -0.03)	-0.08 (-0.19, 0.03)	-0.04 (-0.09, 0.02)
	L VLDL lipids	-0.03 (-0.12, 0.06)	-0.07 (-0.16, 0.02)	-0.05 (-0.15, 0.04)	-0.17 (-0.26, -0.07)	-0.21 (-0.53, 0.12)	-0.11 (-0.28, 0.06)
	M VLDL lipids	-0.03 (-0.14, 0.08)	-0.09 (-0.21, 0.03)	-0.06 (-0.19, 0.06)	-0.19 (-0.31, -0.08)	-0.25 (-0.67, 0.16)	-0.13 (-0.34, 0.08)
	S VLDL lipids	-0.01 (-0.07, 0.05)	-0.05 (-0.11, 0.02)	-0.02 (-0.09, 0.05)	-0.09 (-0.15, -0.03)	-0.08 (-0.32, 0.15)	-0.05 (-0.17, 0.07)
	vS VLDL lipids	0.01 (-0.03, 0.04)	0.01 (-0.03, 0.04)	0.03 (-0.01, 0.06)	0.01 (-0.02, 0.05)	0.03 (-0.10, 0.15)	0.02 (-0.05, 0.08)
	VLDL cholesterol	-0.02 (-0.10, 0.06)	-0.05 (-0.13, 0.03)	-0.01 (-0.10, 0.07)	-0.11 (-0.19, -0.03)	-0.12 (-0.42, 0.18)	-0.05 (-0.20, 0.11)
	VLDL triglycerides	-0.05 (-0.23, 0.12)	-0.15 (-0.34, 0.04)	-0.12 (-0.32, 0.08)	-0.33 (-0.52, -0.14)	-0.41 (-1.07, 0.26)	-0.22 (-0.56, 0.12)
	LDL diameter	-0.00 (-0.05, 0.05)	0.03 (-0.02, 0.08)	0.02 (-0.04, 0.07)	0.01 (-0.04, 0.07)	-0.05 (-0.17, 0.08)	0.02 (-0.04, 0.08)
	L LDL lipids	0.01 (-0.09, 0.11)	0.02 (-0.09, 0.13)	0.08 (-0.04, 0.19)	0.05 (-0.06, 0.16)	0.11 (-0.25, 0.47)	0.06 (-0.12, 0.25)
	M LDL lipids	0.01 (-0.06, 0.07)	0.01 (-0.06, 0.07)	0.05 (-0.02, 0.12)	0.03 (-0.04, 0.10)	0.08 (-0.15, 0.30)	0.03 (-0.09, 0.14)

	S LDL lipids	0.01 (-0.03, 0.05)	0.01 (-0.04, 0.05)	0.02 (-0.02, 0.07)	0.02 (-0.02, 0.06)	0.05 (-0.09, 0.19)	0.01 (-0.06, 0.08)
	LDL cholesterol	0.01 (-0.14, 0.17)	0.02 (-0.14, 0.18)	0.11 (-0.06, 0.28)	0.07 (-0.09, 0.23)	0.17 (-0.37, 0.71)	0.08 (-0.19, 0.36)
	LDL triglycerides	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.02)	-0.01 (-0.02, 0.00)	0.02 (-0.03, 0.07)	0.00 (-0.02, 0.03)
	IDL lipids	0.00 (-0.08, 0.08)	0.02 (-0.07, 0.11)	0.06 (-0.03, 0.15)	0.03 (-0.06, 0.11)	0.08 (-0.21, 0.37)	0.05 (-0.10, 0.20)
	IDL cholesterol	0.01 (-0.05, 0.06)	0.02 (-0.04, 0.08)	0.05 (-0.02, 0.11)	0.03 (-0.03, 0.09)	0.04 (-0.16, 0.25)	0.04 (-0.07, 0.14)
	IDL triglycerides	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.00)	0.01 (-0.02, 0.04)	0.00 (-0.01, 0.02)
	HDL diameter	-0.01 (-0.11, 0.09)	0.07 (-0.03, 0.17)	0.06 (-0.05, 0.17)	0.06 (-0.04, 0.17)	0.00 (-0.29, 0.29)	0.00 (-0.15, 0.15)
	vL HDL lipids	-0.01 (-0.09, 0.07)	0.05 (-0.04, 0.14)	0.06 (-0.03, 0.15)	0.04 (-0.05, 0.12)	0.03 (-0.25, 0.30)	-0.01 (-0.15, 0.13)
	L HDL lipids	0.03 (-0.09, 0.14)	0.10 (-0.03, 0.22)	0.10 (-0.04, 0.23)	0.10 (-0.02, 0.23)	0.22 (-0.20, 0.63)	0.06 (-0.16, 0.27)
	M HDL lipids	0.05 (-0.01, 0.10)	0.04 (-0.02, 0.10)	0.03 (-0.04, 0.09)	0.04 (-0.02, 0.10)	0.19 (-0.04, 0.41)	0.09 (-0.02, 0.21)
	S HDL lipids	0.06 (0.01, 0.11)	0.03 (-0.02, 0.08)	0.01 (-0.05, 0.06)	0.03 (-0.02, 0.08)	0.16 (-0.03, 0.35)	0.05 (-0.04, 0.15)
	HDL1 cholesterol	0.04 (-0.07, 0.15)	0.09 (-0.03, 0.21)	0.10 (-0.03, 0.23)	0.10 (-0.02, 0.22)	0.32 (-0.09, 0.73)	0.10 (-0.11, 0.31)
	HDL2 cholesterol	0.04 (-0.07, 0.14)	0.09 (-0.02, 0.20)	0.09 (-0.02, 0.21)	0.10 (-0.01, 0.21)	0.29 (-0.09, 0.67)	0.09 (-0.10, 0.29)
	HDL3 cholesterol	0.00 (-0.01, 0.01)	0.01 (-0.01, 0.02)	0.01 (-0.00, 0.02)	0.00 (-0.01, 0.01)	0.03 (-0.01, 0.07)	0.01 (-0.01, 0.03)
	HDL triglycerides	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.01)	-0.00 (-0.02, 0.01)	-0.02 (-0.03, -0.01)	-0.01 (-0.06, 0.04)	-0.01 (-0.03, 0.02)
Fatty Acids and Cholines	Total fatty acids	-0.12 (-0.84, 0.60)	-0.24 (-1.00, 0.52)	0.10 (-0.71, 0.91)	-0.86 (-1.62, -0.09)	-0.22 (-2.92, 2.48)	-0.27 (-1.64, 1.11)
	Saturated fatty acids	-0.13 (-0.41, 0.15)	-0.14 (-0.43, 0.16)	0.03 (-0.28, 0.34)	-0.36 (-0.66, -0.07)	-0.14 (-1.20, 0.93)	-0.13 (-0.67, 0.42)
	Saturated:total FAs	-0.66 (-1.42, 0.10)	-0.32 (-1.12, 0.49)	0.11 (-0.75, 0.96)	-0.30 (-1.11, 0.50)	-0.55 (-3.24, 2.14)	-0.15 (-1.52, 1.22)
	Degree of unsaturation	0.02 (-0.01, 0.04)	0.02 (-0.01, 0.05)	0.02 (-0.01, 0.05)	0.04 (0.02, 0.07)	0.05 (-0.02, 0.13)	0.02 (-0.02, 0.06)
	Monounsaturated fatty acids	-0.09 (-0.36, 0.17)	-0.19 (-0.47, 0.09)	-0.05 (-0.35, 0.25)	-0.45 (-0.73, -0.17)	-0.15 (-1.15, 0.85)	-0.20 (-0.71, 0.31)
	Monounsaturated:total FAs	-0.42 (-1.52, 0.69)	-1.11 (-2.27, 0.06)	-0.71 (-1.94, 0.52)	-1.92 (-3.09, -0.76)	-1.06 (-4.17, 2.05)	-1.30 (-2.89, 0.29)
	Polyunsaturated fatty acids	0.10 (-0.15, 0.34)	0.09 (-0.17, 0.35)	0.12 (-0.16, 0.40)	-0.05 (-0.31, 0.21)	0.07 (-0.80, 0.93)	0.06 (-0.39, 0.50)
	Polyunsaturated:total FAs	1.08 (-0.35, 2.50)	1.42 (-0.07, 2.92)	0.60 (-0.98, 2.19)	2.23 (0.73, 3.72)	1.61 (-2.66, 5.87)	1.45 (-0.72, 3.62)
	Omega3 fatty acids	0.02 (-0.02, 0.06)	0.03 (-0.01, 0.06)	0.04 (-0.01, 0.08)	0.01 (-0.03, 0.05)	0.00 (-0.14, 0.15)	-0.02 (-0.09, 0.06)
	Omega3:total FAs	0.20 (-0.06, 0.46)	0.29 (0.02, 0.57)	0.29 (-0.00, 0.58)	0.34 (0.06, 0.61)	0.25 (-0.63, 1.12)	0.01 (-0.44, 0.46)

Lange: Metabolic profiles of mental health

	22:6, docosahexaenoic acid	0.01 (-0.01, 0.02)	0.01 (-0.00, 0.02)	0.02 (0.00, 0.03)	0.01 (-0.00, 0.03)	0.00 (-0.05, 0.06)	-0.01 (-0.03, 0.02)
	Docosahexaenoic:total FAs	0.04 (-0.07, 0.15)	0.11 (-0.01, 0.23)	0.13 (0.01, 0.26)	0.17 (0.06, 0.29)	0.14 (-0.23, 0.50)	-0.02 (-0.21, 0.16)
	Omega6 fatty acids	0.08 (-0.14, 0.29)	0.07 (-0.16, 0.29)	0.09 (-0.16, 0.33)	-0.06 (-0.28, 0.17)	0.06 (-0.69, 0.82)	0.08 (-0.31, 0.46)
	Omega6:total FAs	0.88 (-0.45, 2.20)	1.13 (-0.27, 2.53)	0.31 (-1.17, 1.79)	1.89 (0.50, 3.28)	1.36 (-2.68, 5.40)	1.44 (-0.62, 3.49)
	18:2, linoleic acid	0.07 (-0.13, 0.27)	0.05 (-0.17, 0.26)	0.01 (-0.21, 0.24)	-0.08 (-0.30, 0.13)	-0.05 (-0.76, 0.65)	0.07 (-0.29, 0.43)
	Linoleic:total FAs	0.81 (-0.58, 2.21)	0.92 (-0.54, 2.39)	-0.28 (-1.84, 1.27)	1.30 (-0.17, 2.76)	0.05 (-4.33, 4.43)	1.13 (-1.10, 3.37)
	Total cholines	0.01 (-0.11, 0.12)	0.01 (-0.11, 0.13)	0.08 (-0.04, 0.21)	-0.01 (-0.13, 0.11)	0.17 (-0.25, 0.60)	0.05 (-0.17, 0.27)
	Phosphatidylcholine	0.00 (-0.10, 0.11)	-0.00 (-0.11, 0.11)	0.07 (-0.05, 0.19)	-0.02 (-0.13, 0.09)	0.18 (-0.23, 0.59)	0.05 (-0.16, 0.26)
	Sphingomyelins	0.01 (-0.02, 0.04)	0.01 (-0.01, 0.04)	0.03 (-0.01, 0.06)	0.01 (-0.02, 0.04)	0.00 (-0.10, 0.10)	0.01 (-0.04, 0.06)
Other	ApoA1	0.02 (-0.05, 0.08)	0.03 (-0.04, 0.10)	0.06 (-0.02, 0.13)	0.02 (-0.04, 0.09)	0.16 (-0.08, 0.40)	0.04 (-0.08, 0.17)
	ApoB	-0.01 (-0.07, 0.05)	-0.02 (-0.08, 0.04)	0.01 (-0.06, 0.07)	-0.05 (-0.11, 0.01)	-0.05 (-0.26, 0.17)	-0.02 (-0.13, 0.09)
	ApoB:ApoA1	-0.01 (-0.05, 0.03)	-0.03 (-0.07, 0.02)	-0.01 (-0.05, 0.04)	-0.04 (-0.09, -0.00)	-0.07 (-0.22, 0.08)	-0.03 (-0.10, 0.05)
	Pyruvate	-0.01 (-0.02, 0.00)	-0.02 (-0.03, -0.00)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, 0.00)	-0.02 (-0.06, 0.02)	-0.02 (-0.04, 0.00)
	Citrate	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.02, 0.02)	-0.00 (-0.01, 0.01)
	Glycerol	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	0.01 (-0.00, 0.03)	-0.01 (-0.03, 0.01)	0.02 (-0.02, 0.06)	0.01 (-0.01, 0.03)
	Acetate	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.01 (-0.01, 0.02)	0.00 (-0.00, 0.01)
	Acetoacetate	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.01 (-0.01, 0.04)	-0.00 (-0.01, 0.01)
	3hydroxybutyrate	-0.00 (-0.05, 0.04)	0.02 (-0.03, 0.06)	0.02 (-0.03, 0.07)	0.02 (-0.03, 0.06)	0.01 (-0.09, 0.11)	-0.01 (-0.06, 0.03)
	Alanine	-0.01 (-0.04, 0.02)	-0.02 (-0.05, 0.00)	-0.00 (-0.03, 0.03)	-0.02 (-0.04, 0.01)	-0.03 (-0.11, 0.05)	-0.03 (-0.07, 0.01)
	Glycine	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.00)	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.00)	0.01 (-0.06, 0.09)	-0.01 (-0.04, 0.03)
	Isoleucine	0.00 (-0.01, 0.01)	-0.01 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)	-0.02 (-0.05, -0.00)	-0.00 (-0.02, 0.01)
	Leucine	0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.00)	-0.02 (-0.04, 0.01)	-0.00 (-0.01, 0.01)
	Valine	0.01 (-0.01, 0.03)	-0.00 (-0.02, 0.01)	0.00 (-0.02, 0.02)	-0.00 (-0.02, 0.01)	-0.05 (-0.10, 0.01)	0.00 (-0.03, 0.03)
	Glutamine	0.02 (-0.00, 0.04)	0.02 (-0.00, 0.04)	0.01 (-0.01, 0.04)	0.01 (-0.01, 0.04)	-0.03 (-0.11, 0.05)	0.01 (-0.03, 0.05)
	Histidine	0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)

Phenylalanine	-0.00 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.02, 0.00)	-0.00 (-0.01, 0.00)
Tyrosine	-0.00 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.01, 0.00)	-0.02 (-0.04, 0.00)	-0.01 (-0.02, 0.00)
Creatinine	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.01 (0.00, 0.02)	0.00 (-0.00, 0.01)
Albumin	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.01 (-0.00, 0.01)	0.00 (-0.00, 0.01)
GlycA	0.02 (-0.05, 0.10)	-0.03 (-0.11, 0.05)	0.01 (-0.08, 0.09)	-0.10 (-0.18, -0.02)	-0.17 (-0.42, 0.09)	-0.08 (-0.21, 0.05)

Adjusted coefficient (95% CI) for any reported mental health condition

Group	Metabolite	Child				Adult	
		CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.15 (-0.53, 0.82)	-0.06 (-0.75, 0.62)	0.50 (-0.24, 1.24)	0.04 (-0.65, 0.72)	0.46 (-0.14, 1.06)	0.24 (-0.12, 0.60)
	Remnant cholesterol	0.15 (-0.14, 0.44)	-0.13 (-0.42, 0.17)	-0.01 (-0.32, 0.29)	-0.15 (-0.44, 0.15)	0.07 (-0.20, 0.34)	-0.00 (-0.17, 0.16)
	Esterified cholesterol	0.08 (-0.40, 0.56)	-0.09 (-0.58, 0.41)	0.31 (-0.22, 0.84)	-0.00 (-0.50, 0.49)	0.32 (-0.10, 0.75)	0.17 (-0.09, 0.42)
	Free cholesterol	0.07 (-0.13, 0.26)	0.02 (-0.18, 0.22)	0.19 (-0.03, 0.40)	0.04 (-0.16, 0.24)	0.13 (-0.04, 0.30)	0.08 (-0.03, 0.18)
	Total triglycerides	0.31 (-0.28, 0.90)	-0.36 (-0.96, 0.23)	-0.45 (-1.02, 0.11)	-0.53 (-1.12, 0.06)	-0.12 (-0.59, 0.35)	-0.17 (-0.45, 0.12)
	Total phosphoglycerides	-0.11 (-0.49, 0.28)	-0.26 (-0.65, 0.13)	-0.08 (-0.51, 0.35)	-0.32 (-0.70, 0.07)	0.22 (-0.03, 0.46)	0.12 (-0.03, 0.26)
	VLDL diameter	0.00 (-1.82, 1.83)	-1.25 (-3.08, 0.59)	-2.28 (-4.18, -0.39)	-2.22 (-4.03, -0.42)	-0.57 (-1.65, 0.51)	-0.51 (-1.16, 0.14)
	xL VLDL lipids	0.01 (-0.03, 0.05)	-0.04 (-0.09, -0.00)	-0.04 (-0.08, 0.00)	-0.03 (-0.07, 0.01)	-0.01 (-0.04, 0.02)	-0.01 (-0.03, 0.01)
	vL VLDL lipids	0.02 (-0.07, 0.12)	-0.09 (-0.18, 0.01)	-0.08 (-0.17, 0.01)	-0.08 (-0.17, 0.02)	-0.03 (-0.10, 0.04)	-0.03 (-0.07, 0.01)
	L VLDL lipids	0.10 (-0.17, 0.38)	-0.20 (-0.48, 0.08)	-0.24 (-0.49, 0.02)	-0.24 (-0.52, 0.03)	-0.06 (-0.27, 0.14)	-0.08 (-0.20, 0.04)
	M VLDL lipids	0.18 (-0.16, 0.53)	-0.20 (-0.55, 0.15)	-0.26 (-0.59, 0.07)	-0.31 (-0.65, 0.04)	-0.06 (-0.33, 0.20)	-0.09 (-0.26, 0.07)
	S VLDL lipids	0.12 (-0.05, 0.30)	-0.06 (-0.23, 0.12)	-0.10 (-0.28, 0.08)	-0.16 (-0.33, 0.02)	-0.01 (-0.16, 0.14)	-0.04 (-0.13, 0.05)
	vS VLDL lipids	0.04 (-0.03, 0.12)	0.00 (-0.08, 0.08)	0.04 (-0.04, 0.12)	-0.01 (-0.08, 0.07)	0.03 (-0.05, 0.11)	0.00 (-0.04, 0.05)
	VLDL cholesterol	0.12 (-0.10, 0.34)	-0.12 (-0.35, 0.10)	-0.10 (-0.32, 0.12)	-0.18 (-0.40, 0.05)	0.01 (-0.18, 0.20)	-0.04 (-0.15, 0.08)
	VLDL triglycerides	0.28 (-0.27, 0.83)	-0.35 (-0.91, 0.21)	-0.45 (-0.98, 0.07)	-0.48 (-1.04, 0.08)	-0.14 (-0.57, 0.29)	-0.17 (-0.43, 0.08)
	LDL diameter	-0.09 (-0.19, 0.02)	-0.05 (-0.16, 0.07)	-0.06 (-0.17, 0.06)	-0.00 (-0.12, 0.11)	-0.03 (-0.10, 0.04)	0.01 (-0.04, 0.05)
	L LDL lipids	0.07 (-0.17, 0.31)	0.02 (-0.23, 0.26)	0.17 (-0.09, 0.43)	0.05 (-0.19, 0.30)	0.11 (-0.10, 0.33)	0.05 (-0.08, 0.18)

M LDL lipids	0.06 (-0.09, 0.20)	0.02 (-0.13, 0.17)	0.11 (-0.06, 0.27)	0.03 (-0.11, 0.18)	0.07 (-0.06, 0.21)	0.03 (-0.05, 0.12)
S LDL lipids	0.04 (-0.05, 0.13)	0.01 (-0.08, 0.10)	0.07 (-0.03, 0.17)	0.02 (-0.07, 0.11)	0.05 (-0.04, 0.13)	0.03 (-0.02, 0.08)
LDL cholesterol	0.11 (-0.25, 0.47)	0.05 (-0.32, 0.42)	0.28 (-0.12, 0.68)	0.11 (-0.26, 0.47)	0.18 (-0.14, 0.50)	0.08 (-0.11, 0.28)
LDL triglycerides	0.01 (-0.02, 0.04)	-0.00 (-0.03, 0.03)	0.01 (-0.02, 0.04)	-0.01 (-0.04, 0.02)	0.01 (-0.02, 0.04)	0.00 (-0.02, 0.02)
IDL lipids	0.05 (-0.14, 0.24)	0.00 (-0.19, 0.20)	0.13 (-0.08, 0.34)	0.04 (-0.16, 0.23)	0.09 (-0.08, 0.27)	0.05 (-0.06, 0.15)
IDL cholesterol	0.03 (-0.10, 0.16)	-0.01 (-0.14, 0.13)	0.09 (-0.06, 0.23)	0.03 (-0.11, 0.16)	0.06 (-0.06, 0.18)	0.03 (-0.04, 0.11)
IDL triglycerides	0.01 (-0.01, 0.03)	0.00 (-0.01, 0.02)	0.01 (-0.01, 0.03)	-0.00 (-0.02, 0.01)	0.00 (-0.02, 0.02)	0.00 (-0.01, 0.01)
HDL diameter	-0.11 (-0.38, 0.17)	-0.03 (-0.31, 0.25)	0.21 (-0.08, 0.50)	0.08 (-0.20, 0.36)	0.12 (-0.05, 0.29)	0.12 (0.02, 0.23)
vL HDL lipids	-0.05 (-0.27, 0.16)	-0.02 (-0.24, 0.20)	0.17 (-0.07, 0.40)	0.06 (-0.16, 0.28)	0.12 (-0.03, 0.27)	0.12 (0.03, 0.21)
L HDL lipids	-0.15 (-0.49, 0.19)	0.01 (-0.34, 0.36)	0.26 (-0.10, 0.62)	0.08 (-0.27, 0.43)	0.21 (-0.04, 0.46)	0.18 (0.03, 0.33)
M HDL lipids	-0.05 (-0.20, 0.09)	-0.04 (-0.18, 0.11)	-0.02 (-0.18, 0.14)	-0.06 (-0.20, 0.09)	0.04 (-0.08, 0.17)	0.03 (-0.05, 0.11)
S HDL lipids	0.02 (-0.13, 0.17)	0.04 (-0.11, 0.20)	-0.00 (-0.17, 0.17)	-0.03 (-0.19, 0.12)	0.02 (-0.08, 0.12)	0.00 (-0.06, 0.06)
HDL1 cholesterol	-0.12 (-0.44, 0.20)	0.02 (-0.31, 0.34)	0.23 (-0.10, 0.57)	0.08 (-0.25, 0.40)	0.21 (-0.03, 0.45)	0.16 (0.02, 0.31)
HDL2 cholesterol	-0.12 (-0.42, 0.18)	0.00 (-0.30, 0.31)	0.21 (-0.10, 0.52)	0.07 (-0.23, 0.37)	0.18 (-0.04, 0.40)	0.15 (0.01, 0.28)
HDL3 cholesterol	0.00 (-0.03, 0.03)	0.01 (-0.02, 0.04)	0.02 (-0.01, 0.05)	0.01 (-0.02, 0.04)	0.03 (0.00, 0.05)	0.02 (0.00, 0.03)
HDL triglycerides	0.01 (-0.02, 0.04)	-0.02 (-0.05, 0.02)	-0.02 (-0.05, 0.02)	-0.03 (-0.07, 0.00)	0.01 (-0.02, 0.04)	0.00 (-0.01, 0.02)
Total fatty acids	1.15 (-0.78, 3.07)	-1.23 (-3.21, 0.75)	-0.34 (-2.30, 1.62)	-1.48 (-3.44, 0.49)	0.35 (-1.41, 2.12)	0.10 (-0.96, 1.16)
Saturated fatty acids	0.25 (-0.53, 1.03)	-0.57 (-1.37, 0.23)	-0.30 (-1.10, 0.50)	-0.64 (-1.44, 0.15)	0.08 (-0.61, 0.77)	-0.00 (-0.42, 0.41)
Saturated:total FAs	-1.86 (-4.22, 0.49)	-1.01 (-3.44, 1.42)	-1.51 (-4.17, 1.16)	-1.11 (-3.53, 1.31)	-0.23 (-1.61, 1.15)	-0.10 (-0.92, 0.73)
Degree of unsaturation	0.00 (-0.08, 0.08)	0.06 (-0.02, 0.14)	0.10 (0.01, 0.18)	0.08 (0.00, 0.16)	0.06 (0.02, 0.11)	0.03 (0.00, 0.06)
Monounsaturated fatty acids	0.37 (-0.45, 1.19)	-0.67 (-1.50, 0.16)	-0.57 (-1.36, 0.22)	-0.81 (-1.63, 0.01)	-0.04 (-0.71, 0.63)	-0.10 (-0.50, 0.30)
Monounsaturated:total FAs	-0.07 (-3.40, 3.26)	-3.16 (-6.50, 0.18)	-4.74 (-8.15, -1.34)	-4.10 (-7.39, -0.81)	-1.10 (-3.02, 0.82)	-1.16 (-2.32, 0.00)
Polyunsaturated fatty acids	0.52 (-0.07, 1.12)	0.01 (-0.60, 0.62)	0.53 (-0.12, 1.18)	-0.02 (-0.63, 0.59)	0.31 (-0.21, 0.84)	0.20 (-0.11, 0.52)
Polyunsaturated:total FAs	1.93 (-2.63, 6.49)	4.17 (-0.44, 8.77)	6.25 (1.43, 11.06)	5.21 (0.66, 9.75)	1.33 (-1.12, 3.78)	1.25 (-0.22, 2.73)
Omega3 fatty acids	0.07 (-0.02, 0.17)	0.01 (-0.09, 0.11)	0.09 (-0.01, 0.18)	-0.00 (-0.10, 0.09)	0.11 (0.02, 0.20)	0.05 (-0.01, 0.10)

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	Omega3:total FAs	0.45 (-0.25, 1.15)	0.50 (-0.23, 1.24)	0.98 (0.19, 1.77)	0.56 (-0.17, 1.29)	0.73 (0.24, 1.22)	0.37 (0.07, 0.67)
	22:6, docosahexaenoic acid	0.01 (-0.02, 0.04)	0.01 (-0.03, 0.05)	0.03 (-0.00, 0.07)	0.01 (-0.02, 0.05)	0.05 (0.02, 0.08)	0.02 (0.00, 0.04)
	Docosahexaenoic:total FAs	0.04 (-0.28, 0.36)	0.17 (-0.16, 0.51)	0.36 (-0.01, 0.72)	0.26 (-0.07, 0.59)	0.33 (0.14, 0.51)	0.14 (0.03, 0.26)
	Omega6 fatty acids	0.45 (-0.07, 0.97)	0.00 (-0.54, 0.54)	0.44 (-0.13, 1.01)	-0.02 (-0.55, 0.52)	0.20 (-0.25, 0.65)	0.15 (-0.12, 0.43)
	Omega6:total FAs	1.48 (-2.72, 5.68)	3.67 (-0.56, 7.91)	5.27 (0.88, 9.66)	4.65 (0.47, 8.83)	0.60 (-1.70, 2.89)	0.89 (-0.50, 2.27)
	18:2, linoleic acid	0.45 (-0.05, 0.96)	0.02 (-0.51, 0.55)	0.40 (-0.17, 0.97)	-0.02 (-0.55, 0.50)	0.09 (-0.32, 0.51)	0.11 (-0.14, 0.36)
	Linoleic:total FAs	1.96 (-2.22, 6.14)	3.27 (-0.96, 7.50)	4.81 (0.35, 9.27)	3.66 (-0.55, 7.86)	-0.13 (-2.48, 2.22)	0.51 (-0.90, 1.92)
	Total cholines	-0.05 (-0.38, 0.27)	-0.17 (-0.50, 0.16)	0.10 (-0.25, 0.46)	-0.18 (-0.51, 0.15)	0.25 (0.00, 0.50)	0.15 (-0.00, 0.30)
	Phosphatidylcholine	-0.12 (-0.53, 0.29)	-0.26 (-0.67, 0.16)	-0.06 (-0.52, 0.39)	-0.32 (-0.73, 0.10)	0.23 (-0.01, 0.47)	0.12 (-0.02, 0.26)
	Sphingomyelins	0.04 (-0.04, 0.11)	0.02 (-0.06, 0.09)	0.09 (0.00, 0.17)	0.06 (-0.02, 0.13)	0.04 (-0.02, 0.10)	0.02 (-0.01, 0.06)
Other	ApoA1	-0.04 (-0.22, 0.13)	-0.06 (-0.24, 0.12)	0.10 (-0.10, 0.29)	-0.01 (-0.19, 0.17)	0.12 (-0.02, 0.26)	0.08 (-0.00, 0.16)
	ApoB	0.09 (-0.06, 0.24)	-0.06 (-0.21, 0.09)	-0.02 (-0.17, 0.14)	-0.08 (-0.23, 0.07)	0.03 (-0.11, 0.17)	-0.01 (-0.09, 0.07)
	ApoB:ApoA1	0.07 (-0.04, 0.18)	-0.03 (-0.15, 0.08)	-0.04 (-0.16, 0.07)	-0.06 (-0.17, 0.06)	-0.02 (-0.12, 0.07)	-0.03 (-0.09, 0.02)
	Pyruvate	-0.01 (-0.04, 0.02)	-0.01 (-0.04, 0.01)	-0.01 (-0.04, 0.02)	-0.03 (-0.05, 0.00)	-0.01 (-0.04, 0.01)	-0.00 (-0.02, 0.01)
	Citrate	0.01 (-0.01, 0.03)	-0.00 (-0.02, 0.02)	-0.00 (-0.03, 0.02)	-0.00 (-0.02, 0.02)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)
	Glycerol	0.02 (-0.02, 0.06)	-0.00 (-0.04, 0.04)	-0.01 (-0.05, 0.03)	0.02 (-0.01, 0.06)	-0.01 (-0.03, 0.01)	-0.01 (-0.03, 0.00)
	Acetate	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.00)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	-0.03 (-0.06, 0.00)	-0.02 (-0.04, 0.00)
	Acetoacetate	0.02 (-0.00, 0.04)	0.02 (-0.00, 0.04)	0.01 (-0.01, 0.03)	0.02 (-0.00, 0.04)	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.00)
	3hydroxybutyrate	0.08 (-0.01, 0.18)	0.09 (-0.01, 0.18)	0.06 (-0.04, 0.17)	0.11 (0.01, 0.20)	-0.04 (-0.11, 0.02)	-0.03 (-0.07, 0.01)
	Alanine	-0.03 (-0.09, 0.04)	-0.08 (-0.14, -0.01)	-0.03 (-0.11, 0.04)	-0.07 (-0.14, -0.00)	0.03 (-0.01, 0.07)	0.03 (-0.00, 0.05)
	Glycine	0.00 (-0.03, 0.04)	-0.02 (-0.06, 0.02)	-0.01 (-0.05, 0.04)	-0.01 (-0.05, 0.03)	0.01 (-0.03, 0.05)	0.00 (-0.02, 0.03)
	Isoleucine	-0.00 (-0.03, 0.02)	-0.03 (-0.05, -0.00)	-0.00 (-0.03, 0.02)	-0.01 (-0.03, 0.01)	0.00 (-0.01, 0.02)	-0.00 (-0.01, 0.01)
	Leucine	-0.01 (-0.03, 0.01)	-0.03 (-0.05, -0.00)	0.00 (-0.02, 0.02)	-0.01 (-0.03, 0.02)	0.00 (-0.01, 0.02)	-0.00 (-0.01, 0.01)
	Valine	-0.02 (-0.06, 0.03)	-0.05 (-0.09, -0.00)	0.01 (-0.04, 0.06)	0.00 (-0.04, 0.05)	0.02 (-0.00, 0.05)	0.00 (-0.01, 0.02)
	Glutamine	0.01 (-0.05, 0.06)	-0.03 (-0.09, 0.03)	0.01 (-0.06, 0.07)	-0.02 (-0.08, 0.04)	0.02 (-0.02, 0.07)	-0.00 (-0.03, 0.03)

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Histidine	0.01 (-0.01, 0.02)	-0.00 (-0.02, 0.01)	0.01 (-0.01, 0.02)	0.00 (-0.01, 0.02)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)
Phenylalanine	-0.00 (-0.02, 0.01)	-0.01 (-0.03, -0.00)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)
Tyrosine	-0.01 (-0.03, 0.00)	-0.02 (-0.04, -0.00)	0.00 (-0.02, 0.02)	-0.01 (-0.02, 0.01)	0.01 (-0.00, 0.02)	0.00 (-0.00, 0.01)
Creatinine	-0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.01 (-0.00, 0.02)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)
Albumin	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)
GlycA	0.10 (-0.13, 0.33)	-0.21 (-0.44, 0.01)	-0.06 (-0.28, 0.15)	-0.08 (-0.31, 0.16)	0.03 (-0.12, 0.18)	-0.04 (-0.13, 0.05)

xL, extra large; vL, very large; L, large; M, medium; S, small; vS, very small; VLDL, very low density lipoproteins; LDL, low density lipoproteins; IDL, intermediate density lipoproteins; HDL, high density lipoproteins; FAs, fatty acids; ApoA1, Apolipoprotein A1; ApoB, Apolipoprotein B; GlycA, Glycoprotein acetyls.

Table S7. Regression coefficient and 95% confidence interval on original scale for each metabolite per unit increase in mental health score (on a 0-1 scale), stratified by sex, adjusted for age, SEP, and BMI (for adults) or BMI CDC z-score (for children).

		<i>Adjusted coefficient (95% CI) for females</i>					
Group	Metabolite	Girls				Mothers	
		CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.14 (-0.23, 0.51)	-0.00 (-0.38, 0.38)	0.20 (-0.22, 0.62)	0.12 (-0.26, 0.50)	0.63 (0.11, 1.16)	0.28 (-0.01, 0.57)
	Remnant cholesterol	0.01 (-0.15, 0.16)	-0.07 (-0.23, 0.09)	0.02 (-0.16, 0.19)	-0.13 (-0.29, 0.03)	0.04 (-0.19, 0.27)	0.01 (-0.12, 0.14)
	Esterified cholesterol	0.08 (-0.18, 0.35)	-0.01 (-0.29, 0.26)	0.13 (-0.17, 0.43)	0.08 (-0.20, 0.35)	0.46 (0.08, 0.83)	0.20 (-0.01, 0.41)
	Free cholesterol	0.06 (-0.05, 0.16)	0.01 (-0.10, 0.12)	0.07 (-0.05, 0.20)	0.05 (-0.06, 0.16)	0.17 (0.02, 0.33)	0.07 (-0.01, 0.16)
	Total triglycerides	-0.09 (-0.35, 0.17)	-0.19 (-0.46, 0.08)	-0.11 (-0.40, 0.19)	-0.50 (-0.76, -0.23)	-0.34 (-0.72, 0.04)	-0.18 (-0.39, 0.03)
	Total phosphoglycerides	-0.02 (-0.17, 0.13)	-0.06 (-0.22, 0.09)	0.02 (-0.15, 0.19)	-0.09 (-0.25, 0.06)	0.23 (0.01, 0.45)	0.11 (-0.01, 0.23)
	VLDL diameter	-0.17 (-1.05, 0.71)	-0.47 (-1.38, 0.43)	-0.63 (-1.64, 0.37)	-1.53 (-2.44, -0.63)	-1.29 (-2.24, -0.34)	-0.74 (-1.26, -0.21)
	xL VLDL lipids	-0.01 (-0.03, 0.00)	-0.01 (-0.03, 0.00)	-0.01 (-0.03, 0.01)	-0.03 (-0.05, -0.01)	-0.02 (-0.04, -0.00)	-0.01 (-0.02, 0.00)
	vL VLDL lipids	-0.03 (-0.07, 0.01)	-0.03 (-0.07, 0.01)	-0.02 (-0.07, 0.03)	-0.08 (-0.12, -0.03)	-0.06 (-0.11, -0.01)	-0.02 (-0.05, 0.00)
	L VLDL lipids	-0.06 (-0.18, 0.06)	-0.09 (-0.21, 0.04)	-0.06 (-0.20, 0.07)	-0.22 (-0.34, -0.10)	-0.16 (-0.32, 0.00)	-0.08 (-0.17, 0.01)
	M VLDL lipids	-0.04 (-0.20, 0.11)	-0.11 (-0.27, 0.05)	-0.07 (-0.24, 0.10)	-0.27 (-0.43, -0.12)	-0.19 (-0.40, 0.02)	-0.10 (-0.22, 0.02)
	S VLDL lipids	-0.00 (-0.08, 0.08)	-0.06 (-0.15, 0.02)	-0.02 (-0.12, 0.07)	-0.14 (-0.22, -0.05)	-0.07 (-0.19, 0.06)	-0.05 (-0.12, 0.02)
	vS VLDL lipids	0.03 (-0.02, 0.07)	0.00 (-0.04, 0.05)	0.03 (-0.02, 0.08)	0.02 (-0.03, 0.06)	0.03 (-0.04, 0.10)	0.01 (-0.03, 0.05)
	VLDL cholesterol	-0.02 (-0.12, 0.09)	-0.07 (-0.18, 0.04)	-0.01 (-0.13, 0.11)	-0.16 (-0.26, -0.05)	-0.06 (-0.21, 0.10)	-0.03 (-0.12, 0.05)
	VLDL triglycerides	-0.09 (-0.34, 0.15)	-0.18 (-0.43, 0.07)	-0.12 (-0.40, 0.15)	-0.45 (-0.70, -0.20)	-0.34 (-0.68, -0.01)	-0.18 (-0.36, 0.01)
	LDL diameter	0.01 (-0.05, 0.08)	0.04 (-0.03, 0.10)	0.05 (-0.03, 0.12)	0.04 (-0.03, 0.10)	-0.04 (-0.11, 0.02)	0.01 (-0.03, 0.04)
	L LDL lipids	0.06 (-0.07, 0.19)	-0.00 (-0.14, 0.13)	0.05 (-0.10, 0.20)	0.05 (-0.08, 0.19)	0.18 (-0.01, 0.37)	0.07 (-0.03, 0.18)
	M LDL lipids	0.04 (-0.05, 0.12)	-0.01 (-0.09, 0.07)	0.02 (-0.07, 0.11)	0.03 (-0.05, 0.11)	0.11 (-0.01, 0.23)	0.04 (-0.02, 0.11)
	S LDL lipids	0.03 (-0.02, 0.08)	-0.00 (-0.05, 0.05)	0.01 (-0.05, 0.07)	0.02 (-0.03, 0.08)	0.07 (0.00, 0.15)	0.03 (-0.01, 0.07)
	LDL cholesterol	0.08 (-0.12, 0.27)	-0.03 (-0.23, 0.18)	0.05 (-0.18, 0.27)	0.08 (-0.13, 0.28)	0.28 (0.00, 0.56)	0.11 (-0.04, 0.27)

	LDL triglycerides	0.00 (-0.01, 0.02)	-0.00 (-0.02, 0.01)	0.01 (-0.01, 0.03)	-0.01 (-0.03, 0.00)	0.01 (-0.02, 0.04)	0.00 (-0.01, 0.02)
	IDL lipids	0.03 (-0.07, 0.14)	-0.00 (-0.11, 0.11)	0.05 (-0.07, 0.17)	0.04 (-0.07, 0.15)	0.14 (-0.02, 0.29)	0.06 (-0.02, 0.15)
	IDL cholesterol	0.03 (-0.04, 0.11)	0.01 (-0.07, 0.08)	0.03 (-0.05, 0.12)	0.04 (-0.04, 0.11)	0.10 (-0.01, 0.20)	0.05 (-0.01, 0.10)
	IDL triglycerides	0.01 (-0.00, 0.01)	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.02)	-0.00 (-0.01, 0.01)	-0.00 (-0.02, 0.02)	-0.00 (-0.01, 0.01)
	HDL diameter	0.00 (-0.12, 0.12)	0.08 (-0.05, 0.21)	0.11 (-0.03, 0.25)	0.11 (-0.02, 0.24)	0.14 (-0.01, 0.29)	0.09 (0.01, 0.18)
	vL HDL lipids	-0.02 (-0.12, 0.09)	0.05 (-0.06, 0.15)	0.07 (-0.04, 0.19)	0.06 (-0.04, 0.17)	0.14 (0.00, 0.28)	0.09 (0.01, 0.16)
	L HDL lipids	0.05 (-0.10, 0.20)	0.12 (-0.04, 0.27)	0.16 (-0.01, 0.33)	0.18 (0.03, 0.33)	0.27 (0.05, 0.50)	0.14 (0.02, 0.27)
	M HDL lipids	0.07 (-0.00, 0.14)	0.05 (-0.02, 0.13)	0.06 (-0.02, 0.14)	0.08 (0.01, 0.15)	0.10 (-0.01, 0.21)	0.05 (-0.02, 0.11)
	S HDL lipids	0.09 (0.02, 0.16)	0.05 (-0.02, 0.12)	0.02 (-0.06, 0.10)	0.04 (-0.03, 0.11)	0.06 (-0.04, 0.15)	0.01 (-0.05, 0.06)
	HDL1 cholesterol	0.06 (-0.09, 0.20)	0.10 (-0.05, 0.24)	0.14 (-0.03, 0.30)	0.18 (0.03, 0.32)	0.31 (0.10, 0.52)	0.15 (0.03, 0.27)
	HDL2 cholesterol	0.06 (-0.08, 0.19)	0.09 (-0.04, 0.23)	0.13 (-0.03, 0.28)	0.17 (0.03, 0.31)	0.28 (0.08, 0.48)	0.14 (0.03, 0.25)
	HDL3 cholesterol	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.02)	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	0.03 (0.01, 0.05)	0.01 (0.00, 0.03)
	HDL triglycerides	-0.00 (-0.02, 0.02)	-0.01 (-0.02, 0.01)	0.01 (-0.01, 0.02)	-0.03 (-0.04, -0.01)	-0.00 (-0.03, 0.02)	-0.00 (-0.02, 0.01)
Fatty Acids and Cholines	Total fatty acids	0.03 (-0.94, 0.99)	-0.46 (-1.45, 0.54)	0.11 (-0.99, 1.22)	-1.27 (-2.27, -0.28)	0.10 (-1.38, 1.58)	0.05 (-0.77, 0.87)
	Saturated fatty acids	-0.12 (-0.50, 0.27)	-0.19 (-0.59, 0.20)	-0.02 (-0.46, 0.42)	-0.56 (-0.95, -0.16)	-0.01 (-0.59, 0.57)	0.02 (-0.30, 0.34)
	Saturated:total FAs	-0.96 (-2.00, 0.08)	-0.09 (-1.17, 0.98)	-0.38 (-1.56, 0.81)	-0.69 (-1.75, 0.38)	-0.30 (-1.60, 1.00)	0.19 (-0.53, 0.91)
	Degree of unsaturation	0.02 (-0.02, 0.05)	0.02 (-0.02, 0.06)	0.03 (-0.01, 0.07)	0.07 (0.03, 0.11)	0.08 (0.04, 0.12)	0.03 (0.01, 0.05)
	Monounsaturated fatty acids	-0.07 (-0.44, 0.30)	-0.26 (-0.64, 0.12)	-0.08 (-0.51, 0.34)	-0.66 (-1.03, -0.28)	-0.20 (-0.76, 0.36)	-0.14 (-0.45, 0.17)
	Monounsaturated:total FAs	-0.62 (-2.15, 0.91)	-1.25 (-2.83, 0.32)	-1.15 (-2.88, 0.59)	-2.80 (-4.36, -1.24)	-2.01 (-3.68, -0.34)	-1.58 (-2.51, -0.66)
	Polyunsaturated fatty acids	0.22 (-0.10, 0.53)	0.00 (-0.33, 0.33)	0.22 (-0.15, 0.58)	-0.06 (-0.39, 0.26)	0.32 (-0.14, 0.77)	0.18 (-0.08, 0.43)
	Polyunsaturated:total FAs	1.58 (-0.42, 3.58)	1.35 (-0.72, 3.42)	1.52 (-0.76, 3.81)	3.48 (1.43, 5.54)	2.30 (0.12, 4.48)	1.39 (0.18, 2.60)
	Omega3 fatty acids	0.04 (-0.01, 0.08)	0.01 (-0.04, 0.06)	0.04 (-0.01, 0.10)	-0.00 (-0.05, 0.05)	0.09 (0.02, 0.17)	0.04 (-0.00, 0.08)
	Omega3:total FAs	0.31 (-0.02, 0.65)	0.25 (-0.10, 0.60)	0.40 (0.01, 0.78)	0.39 (0.04, 0.74)	0.78 (0.34, 1.21)	0.33 (0.09, 0.57)
	22:6, docosahexaenoic acid	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.02)	0.02 (-0.00, 0.04)	0.01 (-0.00, 0.03)	0.04 (0.02, 0.07)	0.01 (-0.00, 0.03)
	Docosahexaenoic:total FAs	0.08 (-0.07, 0.22)	0.09 (-0.06, 0.25)	0.15 (-0.02, 0.32)	0.22 (0.07, 0.37)	0.35 (0.18, 0.52)	0.12 (0.03, 0.22)

	Omega6 fatty acids	0.18 (-0.09, 0.46)	-0.01 (-0.30, 0.28)	0.17 (-0.15, 0.49)	-0.06 (-0.35, 0.23)	0.22 (-0.17, 0.62)	0.14 (-0.08, 0.36)
	Omega6:total FAs	1.27 (-0.58, 3.12)	1.10 (-0.81, 3.01)	1.13 (-0.98, 3.24)	3.10 (1.20, 5.00)	1.53 (-0.51, 3.57)	1.06 (-0.06, 2.19)
	18:2, linoleic acid	0.18 (-0.09, 0.45)	-0.02 (-0.29, 0.26)	0.12 (-0.19, 0.42)	-0.10 (-0.37, 0.17)	0.09 (-0.28, 0.46)	0.09 (-0.11, 0.30)
	Linoleic:total FAs	1.35 (-0.57, 3.27)	0.81 (-1.16, 2.79)	0.68 (-1.50, 2.86)	2.11 (0.15, 4.07)	0.42 (-1.75, 2.58)	0.63 (-0.56, 1.83)
	Total cholines	0.02 (-0.13, 0.17)	-0.03 (-0.18, 0.12)	0.08 (-0.09, 0.25)	-0.03 (-0.18, 0.13)	0.28 (0.05, 0.50)	0.13 (0.01, 0.25)
	Phosphatidylcholine	-0.01 (-0.16, 0.14)	-0.06 (-0.21, 0.10)	0.02 (-0.15, 0.20)	-0.08 (-0.23, 0.08)	0.24 (0.03, 0.46)	0.11 (-0.01, 0.22)
	Sphingomyelins	0.02 (-0.01, 0.06)	0.01 (-0.02, 0.05)	0.04 (-0.01, 0.08)	0.03 (-0.00, 0.07)	0.05 (-0.00, 0.10)	0.03 (-0.00, 0.05)
Other	ApoA1	0.03 (-0.05, 0.11)	0.03 (-0.05, 0.12)	0.07 (-0.02, 0.17)	0.06 (-0.03, 0.14)	0.17 (0.04, 0.30)	0.08 (0.01, 0.15)
	ApoB	0.00 (-0.07, 0.08)	-0.04 (-0.12, 0.04)	-0.00 (-0.09, 0.08)	-0.07 (-0.15, 0.01)	0.01 (-0.11, 0.13)	-0.00 (-0.07, 0.06)
	ApoB:ApoA1	-0.01 (-0.07, 0.04)	-0.04 (-0.10, 0.02)	-0.03 (-0.09, 0.03)	-0.07 (-0.13, -0.02)	-0.05 (-0.12, 0.03)	-0.03 (-0.07, 0.02)
	Pyruvate	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.00)	-0.01 (-0.03, 0.00)	-0.01 (-0.02, 0.00)	-0.02 (-0.04, -0.00)	-0.01 (-0.02, 0.00)
	Citrate	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.00)	-0.00 (-0.01, 0.00)
	Glycerol	-0.00 (-0.02, 0.02)	-0.00 (-0.02, 0.02)	-0.00 (-0.02, 0.02)	-0.01 (-0.03, 0.01)	-0.01 (-0.03, 0.01)	-0.01 (-0.02, 0.01)
	Acetate	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	-0.02 (-0.05, 0.00)	-0.01 (-0.03, 0.00)
	Acetoacetate	0.00 (-0.01, 0.01)	0.01 (-0.01, 0.02)	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.02)	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.00)
	3hydroxybutyrate	0.01 (-0.04, 0.06)	0.02 (-0.03, 0.07)	0.01 (-0.05, 0.06)	0.04 (-0.02, 0.09)	-0.03 (-0.09, 0.02)	-0.02 (-0.06, 0.01)
	Alanine	-0.02 (-0.05, 0.02)	-0.03 (-0.07, 0.00)	-0.02 (-0.06, 0.02)	-0.05 (-0.08, -0.01)	-0.00 (-0.04, 0.04)	0.00 (-0.02, 0.02)
	Glycine	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.00)	-0.01 (-0.03, 0.01)	-0.02 (-0.04, -0.00)	0.00 (-0.04, 0.04)	-0.01 (-0.03, 0.01)
	Isoleucine	-0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.00)	0.00 (-0.01, 0.01)	-0.01 (-0.02, -0.00)	-0.01 (-0.02, 0.01)	-0.00 (-0.01, 0.01)
	Leucine	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	0.01 (-0.01, 0.02)	-0.01 (-0.02, 0.00)	-0.00 (-0.02, 0.01)	0.00 (-0.01, 0.01)
	Valine	0.00 (-0.02, 0.02)	-0.01 (-0.03, 0.01)	0.01 (-0.01, 0.03)	-0.00 (-0.02, 0.02)	0.01 (-0.01, 0.04)	0.01 (-0.01, 0.02)
	Glutamine	0.02 (-0.01, 0.05)	0.04 (0.01, 0.07)	0.02 (-0.01, 0.05)	0.02 (-0.01, 0.05)	-0.00 (-0.05, 0.04)	-0.01 (-0.03, 0.01)
	Histidine	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.00)
	Phenylalanine	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	0.00 (-0.00, 0.01)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.01)	0.00 (-0.00, 0.00)
	Tyrosine	-0.01 (-0.01, 0.00)	-0.01 (-0.02, -0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.02, 0.00)	0.01 (-0.00, 0.02)	0.00 (-0.00, 0.01)

	Creatinine	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.00)
	Albumin	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.00 (0.00, 0.01)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)
	GlycA	0.01 (-0.09, 0.11)	-0.06 (-0.17, 0.04)	0.03 (-0.09, 0.14)	-0.11 (-0.21, -0.01)	-0.08 (-0.21, 0.04)	-0.06 (-0.14, 0.01)
<i>Adjusted coefficient (95% CI) for males</i>							
		Boys				Fathers	
Group	Metabolite	CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	-0.08 (-0.45, 0.29)	0.04 (-0.35, 0.43)	0.27 (-0.14, 0.68)	-0.04 (-0.44, 0.35)	-0.95 (-2.44, 0.54)	-0.22 (-0.97, 0.54)
	Remnant cholesterol	-0.04 (-0.19, 0.11)	-0.07 (-0.23, 0.09)	0.01 (-0.15, 0.18)	-0.10 (-0.26, 0.06)	-0.38 (-1.11, 0.35)	-0.34 (-0.71, 0.02)
	Esterified cholesterol	-0.05 (-0.32, 0.21)	0.00 (-0.28, 0.28)	0.18 (-0.12, 0.48)	-0.04 (-0.32, 0.25)	-0.75 (-1.84, 0.33)	-0.15 (-0.70, 0.41)
	Free cholesterol	-0.02 (-0.13, 0.08)	0.03 (-0.08, 0.15)	0.08 (-0.04, 0.20)	0.00 (-0.11, 0.12)	-0.22 (-0.68, 0.23)	-0.04 (-0.27, 0.19)
	Total triglycerides	-0.00 (-0.25, 0.25)	-0.21 (-0.48, 0.05)	-0.20 (-0.46, 0.06)	-0.30 (-0.57, -0.03)	-0.09 (-1.60, 1.43)	-0.81 (-1.57, -0.05)
	Total phosphoglycerides	-0.04 (-0.18, 0.10)	-0.06 (-0.21, 0.09)	0.03 (-0.12, 0.19)	-0.10 (-0.25, 0.05)	-0.07 (-0.70, 0.55)	-0.17 (-0.48, 0.15)
	VLDL diameter	-0.13 (-1.04, 0.77)	-0.66 (-1.62, 0.30)	-0.95 (-1.94, 0.04)	-0.72 (-1.69, 0.25)	-0.51 (-3.26, 2.24)	-1.30 (-2.67, 0.08)
	xL VLDL lipids	0.00 (-0.02, 0.02)	-0.02 (-0.04, -0.00)	-0.01 (-0.03, 0.01)	-0.02 (-0.04, -0.00)	-0.01 (-0.12, 0.09)	-0.05 (-0.11, 0.00)
	vL VLDL lipids	0.00 (-0.04, 0.04)	-0.04 (-0.09, -0.00)	-0.03 (-0.08, 0.01)	-0.05 (-0.09, -0.01)	-0.03 (-0.28, 0.22)	-0.13 (-0.25, -0.00)
	L VLDL lipids	0.01 (-0.11, 0.12)	-0.10 (-0.23, 0.02)	-0.09 (-0.21, 0.03)	-0.14 (-0.26, -0.01)	-0.08 (-0.78, 0.61)	-0.37 (-0.72, -0.03)
	M VLDL lipids	0.00 (-0.14, 0.15)	-0.11 (-0.27, 0.04)	-0.10 (-0.25, 0.06)	-0.15 (-0.31, 0.00)	-0.13 (-0.99, 0.74)	-0.46 (-0.89, -0.03)
	S VLDL lipids	-0.01 (-0.09, 0.07)	-0.05 (-0.14, 0.03)	-0.04 (-0.12, 0.05)	-0.07 (-0.16, 0.02)	-0.06 (-0.47, 0.36)	-0.21 (-0.42, -0.01)
	vS VLDL lipids	-0.01 (-0.06, 0.03)	-0.00 (-0.05, 0.04)	0.02 (-0.03, 0.07)	-0.01 (-0.06, 0.03)	-0.06 (-0.25, 0.13)	-0.06 (-0.15, 0.03)
	VLDL cholesterol	-0.02 (-0.12, 0.08)	-0.08 (-0.18, 0.03)	-0.04 (-0.15, 0.07)	-0.10 (-0.21, 0.01)	-0.16 (-0.72, 0.40)	-0.29 (-0.57, -0.01)
	VLDL triglycerides	0.02 (-0.22, 0.25)	-0.20 (-0.45, 0.05)	-0.18 (-0.43, 0.06)	-0.27 (-0.52, -0.02)	-0.13 (-1.54, 1.28)	-0.76 (-1.46, -0.06)
	LDL diameter	-0.03 (-0.09, 0.03)	0.02 (-0.05, 0.08)	-0.03 (-0.09, 0.04)	-0.01 (-0.07, 0.06)	0.06 (-0.10, 0.21)	0.04 (-0.04, 0.11)
	L LDL lipids	-0.04 (-0.17, 0.10)	0.02 (-0.12, 0.16)	0.10 (-0.04, 0.25)	0.02 (-0.12, 0.16)	-0.35 (-0.89, 0.18)	-0.08 (-0.35, 0.19)
	M LDL lipids	-0.02 (-0.10, 0.06)	0.01 (-0.07, 0.10)	0.07 (-0.02, 0.16)	0.01 (-0.07, 0.10)	-0.23 (-0.56, 0.10)	-0.05 (-0.22, 0.12)
S LDL lipids	-0.01 (-0.06, 0.04)	0.00 (-0.05, 0.05)	0.04 (-0.02, 0.09)	0.00 (-0.05, 0.06)	-0.15 (-0.36, 0.06)	-0.03 (-0.13, 0.08)	

	LDL cholesterol	-0.04 (-0.23, 0.16)	0.03 (-0.17, 0.24)	0.17 (-0.05, 0.38)	0.04 (-0.17, 0.25)	-0.57 (-1.37, 0.23)	-0.10 (-0.50, 0.31)
	LDL triglycerides	-0.01 (-0.02, 0.01)	-0.00 (-0.02, 0.01)	0.00 (-0.02, 0.02)	-0.01 (-0.02, 0.01)	0.01 (-0.05, 0.08)	-0.02 (-0.05, 0.02)
	IDL lipids	-0.03 (-0.13, 0.08)	0.02 (-0.09, 0.13)	0.08 (-0.04, 0.19)	0.00 (-0.11, 0.11)	-0.27 (-0.71, 0.16)	-0.06 (-0.28, 0.15)
	IDL cholesterol	-0.02 (-0.10, 0.05)	0.01 (-0.07, 0.09)	0.06 (-0.03, 0.14)	0.01 (-0.07, 0.09)	-0.23 (-0.54, 0.08)	-0.03 (-0.19, 0.12)
	IDL triglycerides	-0.00 (-0.01, 0.00)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.00)	0.01 (-0.03, 0.06)	-0.01 (-0.03, 0.02)
	HDL diameter	-0.04 (-0.17, 0.08)	0.03 (-0.11, 0.17)	0.04 (-0.10, 0.18)	0.01 (-0.12, 0.15)	0.01 (-0.38, 0.41)	0.18 (-0.02, 0.38)
	vL HDL lipids	-0.02 (-0.13, 0.09)	0.03 (-0.09, 0.15)	0.06 (-0.06, 0.18)	0.00 (-0.12, 0.12)	-0.07 (-0.39, 0.25)	0.08 (-0.08, 0.24)
	L HDL lipids	-0.03 (-0.19, 0.14)	0.06 (-0.11, 0.23)	0.07 (-0.11, 0.24)	0.02 (-0.15, 0.19)	0.11 (-0.42, 0.64)	0.29 (0.03, 0.55)
	M HDL lipids	0.01 (-0.07, 0.09)	0.02 (-0.06, 0.10)	-0.01 (-0.10, 0.07)	-0.02 (-0.10, 0.06)	-0.03 (-0.35, 0.30)	0.09 (-0.08, 0.26)
	S HDL lipids	0.02 (-0.04, 0.08)	0.02 (-0.05, 0.08)	-0.01 (-0.08, 0.06)	0.00 (-0.07, 0.07)	-0.02 (-0.33, 0.29)	0.04 (-0.12, 0.19)
	HDL1 cholesterol	-0.00 (-0.16, 0.15)	0.07 (-0.09, 0.24)	0.09 (-0.08, 0.26)	0.02 (-0.15, 0.18)	-0.01 (-0.55, 0.54)	0.22 (-0.05, 0.49)
	HDL2 cholesterol	-0.00 (-0.15, 0.14)	0.07 (-0.09, 0.22)	0.08 (-0.08, 0.24)	0.02 (-0.14, 0.17)	-0.01 (-0.52, 0.50)	0.22 (-0.04, 0.47)
	HDL3 cholesterol	0.00 (-0.01, 0.01)	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	-0.00 (-0.02, 0.01)	0.01 (-0.05, 0.06)	0.00 (-0.02, 0.03)
	HDL triglycerides	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.01)	-0.01 (-0.03, 0.00)	-0.02 (-0.03, 0.00)	0.01 (-0.06, 0.09)	-0.02 (-0.06, 0.01)
Fatty Acids and Cholines	Total fatty acids	-0.21 (-1.13, 0.70)	-0.51 (-1.48, 0.46)	-0.10 (-1.10, 0.90)	-0.79 (-1.78, 0.20)	-1.66 (-6.29, 2.98)	-2.13 (-4.46, 0.20)
	Saturated fatty acids	-0.13 (-0.47, 0.22)	-0.25 (-0.62, 0.12)	-0.02 (-0.40, 0.36)	-0.29 (-0.67, 0.08)	-0.61 (-2.45, 1.24)	-0.98 (-1.91, -0.06)
	Saturated:total FAs	-0.54 (-1.52, 0.44)	-0.46 (-1.49, 0.58)	0.30 (-0.80, 1.39)	0.04 (-1.01, 1.09)	0.15 (-3.02, 3.32)	-1.54 (-3.13, 0.05)
	Degree of unsaturation	0.02 (-0.02, 0.05)	0.04 (0.00, 0.07)	0.03 (-0.01, 0.06)	0.02 (-0.01, 0.06)	0.02 (-0.10, 0.14)	0.07 (0.01, 0.13)
	Monounsaturated fatty acids	-0.11 (-0.44, 0.23)	-0.35 (-0.70, 0.00)	-0.19 (-0.54, 0.17)	-0.42 (-0.77, -0.06)	-0.64 (-2.44, 1.15)	-1.02 (-1.91, -0.12)
	Monounsaturated:total FAs	-0.47 (-1.86, 0.92)	-1.92 (-3.39, -0.46)	-1.51 (-3.03, 0.01)	-1.86 (-3.35, -0.37)	-1.37 (-6.24, 3.50)	-2.87 (-5.30, -0.43)
	Polyunsaturated fatty acids	0.02 (-0.30, 0.34)	0.09 (-0.25, 0.43)	0.10 (-0.25, 0.46)	-0.08 (-0.43, 0.26)	-0.40 (-1.71, 0.90)	-0.13 (-0.79, 0.53)
	Polyunsaturated:total FAs	1.01 (-0.76, 2.78)	2.38 (0.52, 4.24)	1.21 (-0.72, 3.15)	1.82 (-0.08, 3.71)	1.22 (-5.03, 7.46)	4.41 (1.31, 7.50)
	Omega3 fatty acids	0.01 (-0.04, 0.06)	0.03 (-0.02, 0.08)	0.04 (-0.02, 0.09)	0.01 (-0.05, 0.06)	-0.01 (-0.27, 0.26)	-0.03 (-0.17, 0.10)
	Omega3:total FAs	0.14 (-0.20, 0.49)	0.39 (0.03, 0.75)	0.38 (-0.00, 0.76)	0.32 (-0.05, 0.69)	0.32 (-1.02, 1.66)	0.41 (-0.27, 1.08)
	22:6, docosahexaenoic acid	0.00 (-0.01, 0.02)	0.01 (-0.00, 0.03)	0.02 (-0.00, 0.04)	0.01 (-0.01, 0.03)	-0.01 (-0.10, 0.08)	-0.01 (-0.06, 0.03)

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	Docosahexaenoic:total FAs	0.02 (-0.13, 0.16)	0.14 (-0.01, 0.29)	0.18 (0.02, 0.34)	0.14 (-0.02, 0.29)	0.00 (-0.54, 0.54)	0.08 (-0.19, 0.36)
	Omega6 fatty acids	0.01 (-0.27, 0.29)	0.06 (-0.23, 0.36)	0.07 (-0.25, 0.38)	-0.09 (-0.39, 0.21)	-0.40 (-1.49, 0.70)	-0.09 (-0.65, 0.46)
	Omega6:total FAs	0.87 (-0.80, 2.53)	1.99 (0.24, 3.73)	0.83 (-0.98, 2.65)	1.50 (-0.28, 3.28)	0.90 (-5.16, 6.96)	4.00 (0.99, 7.01)
	18:2, linoleic acid	-0.01 (-0.27, 0.25)	0.04 (-0.23, 0.32)	-0.01 (-0.29, 0.28)	-0.09 (-0.36, 0.19)	-0.30 (-1.28, 0.67)	-0.02 (-0.52, 0.48)
	Linoleic:total FAs	0.64 (-1.12, 2.40)	1.69 (-0.16, 3.54)	0.17 (-1.77, 2.11)	1.23 (-0.65, 3.11)	1.03 (-4.70, 6.76)	3.75 (0.91, 6.60)
	Total cholines	-0.04 (-0.19, 0.11)	-0.03 (-0.19, 0.13)	0.06 (-0.11, 0.22)	-0.08 (-0.24, 0.08)	-0.17 (-0.74, 0.39)	-0.07 (-0.35, 0.22)
	Phosphatidylcholine	-0.04 (-0.18, 0.10)	-0.05 (-0.20, 0.09)	0.04 (-0.12, 0.19)	-0.10 (-0.25, 0.06)	-0.14 (-0.68, 0.40)	-0.09 (-0.37, 0.18)
	Sphingomyelins	-0.00 (-0.04, 0.04)	0.01 (-0.03, 0.05)	0.03 (-0.01, 0.07)	0.00 (-0.04, 0.04)	-0.04 (-0.16, 0.08)	0.00 (-0.06, 0.06)
Other	ApoA1	-0.01 (-0.10, 0.08)	0.01 (-0.09, 0.10)	0.04 (-0.06, 0.14)	-0.02 (-0.12, 0.07)	-0.06 (-0.36, 0.24)	0.04 (-0.12, 0.19)
	ApoB	-0.01 (-0.09, 0.06)	-0.03 (-0.11, 0.05)	0.01 (-0.08, 0.09)	-0.05 (-0.13, 0.03)	-0.20 (-0.57, 0.18)	-0.19 (-0.38, -0.00)
	ApoB:ApoA1	-0.01 (-0.06, 0.05)	-0.03 (-0.08, 0.03)	-0.00 (-0.06, 0.05)	-0.03 (-0.08, 0.03)	-0.11 (-0.37, 0.15)	-0.15 (-0.27, -0.02)
	Pyruvate	-0.01 (-0.02, 0.01)	-0.02 (-0.04, -0.01)	-0.01 (-0.02, 0.01)	-0.01 (-0.03, 0.00)	0.00 (-0.05, 0.05)	-0.02 (-0.04, 0.01)
	Citrate	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.02)	0.03 (0.01, 0.06)	0.01 (-0.00, 0.03)
	Glycerol	0.02 (-0.00, 0.04)	0.01 (-0.01, 0.04)	0.02 (-0.00, 0.04)	0.01 (-0.01, 0.03)	0.01 (-0.04, 0.06)	-0.00 (-0.03, 0.03)
	Acetate	0.00 (-0.00, 0.01)	-0.00 (-0.00, 0.00)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	-0.02 (-0.07, 0.03)	-0.01 (-0.04, 0.01)
	Acetoacetate	-0.00 (-0.01, 0.01)	0.01 (-0.01, 0.02)	0.00 (-0.01, 0.02)	-0.00 (-0.01, 0.01)	-0.01 (-0.05, 0.03)	-0.01 (-0.03, 0.01)
	3hydroxybutyrate	0.01 (-0.04, 0.07)	0.04 (-0.02, 0.11)	0.05 (-0.02, 0.11)	0.03 (-0.04, 0.09)	-0.01 (-0.14, 0.12)	-0.04 (-0.10, 0.03)
	Alanine	-0.02 (-0.05, 0.02)	-0.04 (-0.08, -0.01)	-0.00 (-0.04, 0.04)	-0.00 (-0.04, 0.03)	0.11 (0.00, 0.21)	0.03 (-0.02, 0.09)
	Glycine	-0.01 (-0.03, 0.00)	-0.02 (-0.04, 0.00)	-0.01 (-0.03, 0.01)	-0.01 (-0.03, 0.01)	0.02 (-0.03, 0.07)	0.00 (-0.02, 0.03)
	Isoleucine	-0.00 (-0.01, 0.01)	-0.01 (-0.02, -0.00)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, 0.00)	0.01 (-0.03, 0.04)	-0.01 (-0.02, 0.01)
	Leucine	0.00 (-0.01, 0.01)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, 0.00)	0.02 (-0.02, 0.06)	-0.00 (-0.02, 0.02)
	Valine	0.01 (-0.01, 0.03)	-0.01 (-0.04, 0.01)	-0.01 (-0.03, 0.02)	-0.00 (-0.02, 0.02)	0.01 (-0.05, 0.07)	0.00 (-0.03, 0.03)
	Glutamine	0.00 (-0.03, 0.03)	-0.03 (-0.06, 0.00)	-0.01 (-0.04, 0.03)	-0.01 (-0.04, 0.02)	0.07 (-0.03, 0.17)	0.04 (-0.01, 0.09)
	Histidine	0.00 (-0.00, 0.01)	-0.01 (-0.01, -0.00)	0.00 (-0.01, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.01, 0.02)	0.00 (-0.00, 0.01)
	Phenylalanine	-0.01 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.01, 0.00)	0.00 (-0.01, 0.02)	0.00 (-0.01, 0.01)

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Tyrosine	-0.00 (-0.01, 0.01)	-0.01 (-0.02, -0.00)	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.01)	-0.01 (-0.03, 0.01)	-0.00 (-0.01, 0.01)
Creatinine	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.02, 0.02)	0.01 (-0.00, 0.02)
Albumin	0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	-0.00 (-0.01, 0.01)	-0.00 (-0.01, 0.00)
GlycA	0.03 (-0.07, 0.13)	-0.06 (-0.16, 0.05)	-0.03 (-0.14, 0.07)	-0.11 (-0.21, -0.00)	0.07 (-0.40, 0.54)	-0.19 (-0.42, 0.05)

xL, extra large; vL, very large; L, large; M, medium; S, small; vS, very small; VLDL, very low density lipoproteins; LDL, low density lipoproteins; IDL, intermediate density lipoproteins; HDL, high density lipoproteins; FAs, fatty acids; ApoA1, Apolipoprotein A1; ApoB, Apolipoprotein B; GlycA, Glycoprotein acetyls.

Table S8. Regression coefficient and 95% confidence interval for each mental health score (on a 0-1 scale) per unit increase in each metabolite (on original scale), for unadjusted regression, and adjusted for age, sex, SEP, and BMI (for adults) or BMI CDC z-score (for children).

		<i>Unadjusted coefficient (95% CI)</i>					
Group	Metabolite	Child				Adult	
		CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.00 (-0.01, 0.02)	0.01 (-0.01, 0.02)	0.01 (0.00, 0.02)	0.01 (-0.01, 0.02)	0.01 (0.00, 0.01)	0.01 (-0.00, 0.02)
	Remnant cholesterol	-0.01 (-0.04, 0.02)	-0.02 (-0.05, 0.01)	-0.01 (-0.04, 0.02)	-0.04 (-0.07, -0.01)	-0.01 (-0.02, 0.01)	-0.03 (-0.05, -0.00)
	Esterified cholesterol	0.00 (-0.02, 0.02)	0.01 (-0.01, 0.02)	0.02 (-0.00, 0.03)	0.01 (-0.01, 0.02)	0.01 (0.00, 0.02)	0.01 (-0.00, 0.03)
	Free cholesterol	0.01 (-0.03, 0.06)	0.03 (-0.01, 0.07)	0.05 (0.01, 0.09)	0.03 (-0.01, 0.07)	0.02 (0.00, 0.04)	0.03 (-0.01, 0.07)
	Total triglycerides	-0.01 (-0.02, 0.01)	-0.02 (-0.04, -0.01)	-0.02 (-0.04, -0.01)	-0.04 (-0.06, -0.03)	-0.01 (-0.02, -0.00)	-0.03 (-0.04, -0.02)
	Total phosphoglycerides	-0.01 (-0.04, 0.03)	-0.01 (-0.04, 0.02)	0.01 (-0.02, 0.04)	-0.02 (-0.05, 0.01)	0.01 (0.00, 0.03)	0.02 (-0.01, 0.04)
	VLDL diameter	-0.00 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.02, -0.01)	-0.01 (-0.01, -0.00)	-0.01 (-0.02, -0.01)
	xL VLDL lipids	-0.15 (-0.40, 0.11)	-0.37 (-0.62, -0.13)	-0.35 (-0.58, -0.11)	-0.61 (-0.84, -0.37)	-0.16 (-0.28, -0.05)	-0.44 (-0.65, -0.22)
	vL VLDL lipids	-0.06 (-0.18, 0.05)	-0.16 (-0.27, -0.05)	-0.16 (-0.27, -0.06)	-0.28 (-0.38, -0.17)	-0.07 (-0.12, -0.02)	-0.20 (-0.29, -0.11)
	L VLDL lipids	-0.02 (-0.06, 0.02)	-0.05 (-0.09, -0.01)	-0.06 (-0.09, -0.02)	-0.10 (-0.13, -0.06)	-0.02 (-0.04, -0.01)	-0.07 (-0.10, -0.04)
	M VLDL lipids	-0.01 (-0.04, 0.02)	-0.04 (-0.07, -0.01)	-0.04 (-0.07, -0.01)	-0.07 (-0.10, -0.04)	-0.02 (-0.03, -0.01)	-0.05 (-0.07, -0.03)
	S VLDL lipids	-0.01 (-0.07, 0.04)	-0.07 (-0.12, -0.01)	-0.06 (-0.11, -0.01)	-0.12 (-0.17, -0.07)	-0.03 (-0.05, -0.00)	-0.09 (-0.13, -0.04)
	vS VLDL lipids	0.02 (-0.09, 0.13)	0.01 (-0.10, 0.11)	0.04 (-0.06, 0.14)	-0.01 (-0.11, 0.10)	-0.01 (-0.05, 0.04)	-0.07 (-0.15, 0.02)
	VLDL cholesterol	-0.02 (-0.06, 0.03)	-0.05 (-0.09, -0.01)	-0.04 (-0.08, -0.00)	-0.09 (-0.13, -0.05)	-0.02 (-0.04, -0.00)	-0.06 (-0.09, -0.03)
	VLDL triglycerides	-0.01 (-0.03, 0.01)	-0.03 (-0.04, -0.01)	-0.03 (-0.05, -0.01)	-0.05 (-0.07, -0.03)	-0.01 (-0.02, -0.00)	-0.03 (-0.05, -0.02)
	LDL diameter	-0.02 (-0.09, 0.06)	0.06 (-0.02, 0.13)	0.02 (-0.05, 0.09)	0.03 (-0.04, 0.11)	-0.04 (-0.09, 0.01)	0.01 (-0.08, 0.10)
	L LDL lipids	0.01 (-0.03, 0.04)	0.01 (-0.02, 0.05)	0.03 (-0.01, 0.06)	0.02 (-0.02, 0.05)	0.01 (-0.01, 0.03)	0.01 (-0.02, 0.04)
	M LDL lipids	0.01 (-0.05, 0.07)	0.01 (-0.04, 0.07)	0.04 (-0.01, 0.10)	0.03 (-0.03, 0.08)	0.02 (-0.01, 0.04)	0.01 (-0.04, 0.06)
	S LDL lipids	0.03 (-0.07, 0.12)	0.02 (-0.07, 0.11)	0.06 (-0.02, 0.15)	0.05 (-0.04, 0.14)	0.03 (-0.01, 0.07)	0.03 (-0.05, 0.11)
	LDL cholesterol	0.00 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.02 (-0.00, 0.04)	0.01 (-0.01, 0.04)	0.01 (-0.00, 0.02)	0.01 (-0.01, 0.03)

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	LDL triglycerides	-0.04 (-0.36, 0.27)	-0.02 (-0.33, 0.29)	0.12 (-0.17, 0.41)	-0.26 (-0.56, 0.04)	0.00 (-0.11, 0.11)	-0.10 (-0.31, 0.10)
	IDL lipids	0.00 (-0.04, 0.05)	0.02 (-0.03, 0.06)	0.04 (-0.01, 0.08)	0.02 (-0.03, 0.06)	0.01 (-0.01, 0.03)	0.01 (-0.03, 0.05)
	IDL cholesterol	0.01 (-0.05, 0.07)	0.03 (-0.03, 0.09)	0.05 (-0.01, 0.11)	0.03 (-0.03, 0.09)	0.02 (-0.01, 0.05)	0.02 (-0.03, 0.08)
	IDL triglycerides	0.09 (-0.45, 0.63)	0.14 (-0.38, 0.66)	0.19 (-0.30, 0.68)	-0.25 (-0.76, 0.26)	-0.07 (-0.26, 0.11)	-0.32 (-0.66, 0.02)
	HDL diameter	-0.00 (-0.04, 0.03)	0.04 (0.01, 0.08)	0.05 (0.02, 0.09)	0.05 (0.02, 0.08)	0.03 (0.01, 0.05)	0.08 (0.05, 0.11)
	vL HDL lipids	-0.00 (-0.05, 0.04)	0.04 (-0.00, 0.08)	0.06 (0.02, 0.10)	0.05 (0.01, 0.09)	0.03 (0.01, 0.05)	0.09 (0.05, 0.12)
	L HDL lipids	0.01 (-0.02, 0.04)	0.04 (0.01, 0.07)	0.05 (0.02, 0.08)	0.05 (0.02, 0.07)	0.02 (0.01, 0.03)	0.06 (0.03, 0.08)
	M HDL lipids	0.05 (-0.01, 0.11)	0.05 (-0.01, 0.11)	0.03 (-0.02, 0.09)	0.05 (-0.01, 0.11)	0.02 (-0.00, 0.05)	0.05 (0.00, 0.10)
	S HDL lipids	0.08 (0.01, 0.15)	0.04 (-0.03, 0.11)	0.00 (-0.06, 0.07)	0.02 (-0.04, 0.09)	0.01 (-0.03, 0.04)	-0.01 (-0.07, 0.05)
	HDL1 cholesterol	0.01 (-0.02, 0.04)	0.04 (0.01, 0.07)	0.05 (0.02, 0.08)	0.05 (0.02, 0.07)	0.03 (0.01, 0.04)	0.06 (0.03, 0.08)
	HDL2 cholesterol	0.01 (-0.02, 0.05)	0.04 (0.01, 0.07)	0.05 (0.02, 0.08)	0.05 (0.02, 0.08)	0.03 (0.01, 0.04)	0.06 (0.04, 0.09)
	HDL3 cholesterol	0.07 (-0.27, 0.41)	0.31 (-0.02, 0.64)	0.47 (0.15, 0.78)	0.30 (-0.03, 0.62)	0.29 (0.15, 0.43)	0.54 (0.27, 0.80)
	HDL triglycerides	-0.11 (-0.39, 0.18)	-0.15 (-0.42, 0.12)	-0.14 (-0.39, 0.12)	-0.50 (-0.77, -0.23)	-0.06 (-0.19, 0.06)	-0.22 (-0.44, 0.01)
Fatty Acids and Cholines	Total fatty acids	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.01, -0.00)
	Saturated fatty acids	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.00)	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.01)	-0.00 (-0.01, 0.00)	-0.01 (-0.02, -0.00)
	Saturated:total FAs	-0.00 (-0.01, -0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.00, 0.00)
	Degree of unsaturation	0.10 (-0.04, 0.24)	0.16 (0.02, 0.29)	0.18 (0.06, 0.31)	0.29 (0.16, 0.42)	0.19 (0.11, 0.26)	0.36 (0.23, 0.50)
	Monounsaturated fatty acids	-0.01 (-0.02, 0.01)	-0.02 (-0.03, -0.00)	-0.01 (-0.03, -0.00)	-0.03 (-0.04, -0.02)	-0.01 (-0.01, -0.00)	-0.02 (-0.03, -0.01)
	Monounsaturated:total FAs	-0.00 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.01, -0.01)	-0.00 (-0.01, -0.00)	-0.01 (-0.01, -0.01)
	Polyunsaturated fatty acids	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	0.01 (-0.00, 0.02)	-0.00 (-0.02, 0.01)	0.00 (-0.00, 0.01)	0.00 (-0.01, 0.02)
	Polyunsaturated:total FAs	0.00 (0.00, 0.01)	0.00 (0.00, 0.01)	0.00 (0.00, 0.01)	0.01 (0.00, 0.01)	0.00 (0.00, 0.00)	0.01 (0.00, 0.01)
	Omega3 fatty acids	0.06 (-0.03, 0.16)	0.06 (-0.03, 0.15)	0.09 (0.00, 0.18)	0.01 (-0.08, 0.10)	0.05 (0.01, 0.09)	0.05 (-0.02, 0.12)
	Omega3:total FAs	0.01 (-0.00, 0.03)	0.02 (0.01, 0.03)	0.02 (0.01, 0.03)	0.02 (0.01, 0.03)	0.02 (0.01, 0.02)	0.03 (0.02, 0.04)
	22:6, docosahexaenoic acid	0.16 (-0.13, 0.45)	0.30 (0.02, 0.57)	0.40 (0.14, 0.66)	0.32 (0.05, 0.59)	0.22 (0.10, 0.34)	0.27 (0.05, 0.49)
	Docosahexaenoic:total FAs	0.02 (-0.02, 0.05)	0.04 (0.01, 0.07)	0.05 (0.02, 0.08)	0.06 (0.03, 0.09)	0.04 (0.03, 0.06)	0.07 (0.04, 0.11)

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	Omega6 fatty acids	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	-0.00 (-0.02, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.02)
	Omega6:total FAs	0.00 (-0.00, 0.01)	0.00 (0.00, 0.01)	0.00 (0.00, 0.01)	0.01 (0.00, 0.01)	0.00 (0.00, 0.00)	0.01 (0.00, 0.01)
	18:2, linoleic acid	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.02)	0.01 (-0.01, 0.02)	-0.00 (-0.02, 0.01)	0.00 (-0.01, 0.01)	0.00 (-0.01, 0.02)
	Linoleic:total FAs	0.00 (-0.00, 0.00)	0.00 (0.00, 0.01)	0.00 (0.00, 0.00)	0.00 (0.00, 0.01)	0.00 (-0.00, 0.00)	0.00 (0.00, 0.01)
	Total cholines	-0.00 (-0.03, 0.03)	0.00 (-0.03, 0.03)	0.02 (-0.00, 0.05)	-0.00 (-0.04, 0.03)	0.02 (0.00, 0.03)	0.03 (0.00, 0.05)
	Phosphatidylcholine	-0.01 (-0.04, 0.03)	-0.01 (-0.04, 0.02)	0.01 (-0.02, 0.04)	-0.02 (-0.05, 0.01)	0.02 (0.00, 0.03)	0.02 (-0.01, 0.05)
	Sphingomyelins	0.07 (-0.06, 0.20)	0.12 (-0.00, 0.25)	0.19 (0.07, 0.30)	0.14 (0.02, 0.26)	0.07 (0.00, 0.13)	0.14 (0.02, 0.25)
Other	ApoA1	0.02 (-0.03, 0.07)	0.04 (-0.01, 0.09)	0.07 (0.02, 0.12)	0.05 (-0.00, 0.10)	0.04 (0.02, 0.06)	0.08 (0.04, 0.13)
	ApoB	-0.01 (-0.07, 0.05)	-0.04 (-0.10, 0.02)	-0.02 (-0.08, 0.03)	-0.08 (-0.14, -0.02)	-0.01 (-0.04, 0.01)	-0.06 (-0.11, -0.01)
	ApoB:ApoA1	-0.03 (-0.12, 0.05)	-0.09 (-0.17, -0.01)	-0.09 (-0.16, -0.01)	-0.15 (-0.23, -0.07)	-0.05 (-0.08, -0.01)	-0.13 (-0.19, -0.07)
	Pyruvate	-0.26 (-0.60, 0.09)	-0.53 (-0.87, -0.20)	-0.31 (-0.62, 0.01)	-0.39 (-0.72, -0.06)	-0.26 (-0.41, -0.11)	-0.56 (-0.84, -0.28)
	Citrate	0.15 (-0.32, 0.61)	0.29 (-0.16, 0.74)	0.38 (-0.04, 0.80)	0.40 (-0.04, 0.83)	-0.09 (-0.39, 0.21)	0.02 (-0.54, 0.57)
	Glycerol	0.36 (-0.15, 0.87)	0.07 (-0.42, 0.57)	0.02 (-0.46, 0.49)	-0.15 (-0.62, 0.31)	-0.40 (-0.74, -0.05)	-1.06 (-1.69, -0.43)
	Acetate	1.09 (-0.42, 2.59)	0.20 (-1.25, 1.66)	0.69 (-0.67, 2.05)	1.16 (-0.26, 2.59)	-0.10 (-0.23, 0.03)	-0.21 (-0.44, 0.03)
	Acetoacetate	0.04 (-0.40, 0.48)	0.37 (-0.06, 0.80)	0.18 (-0.22, 0.58)	0.23 (-0.19, 0.65)	0.01 (-0.23, 0.25)	-0.18 (-0.62, 0.26)
	3hydroxybutyrate	0.03 (-0.06, 0.12)	0.08 (-0.00, 0.17)	0.07 (-0.01, 0.16)	0.08 (-0.00, 0.17)	-0.03 (-0.09, 0.03)	-0.09 (-0.20, 0.02)
	Alanine	-0.10 (-0.24, 0.04)	-0.18 (-0.32, -0.05)	-0.05 (-0.18, 0.08)	-0.14 (-0.27, -0.01)	0.01 (-0.07, 0.10)	0.02 (-0.13, 0.17)
	Glycine	-0.17 (-0.42, 0.08)	-0.23 (-0.48, 0.01)	-0.11 (-0.34, 0.12)	-0.25 (-0.49, -0.01)	0.01 (-0.08, 0.09)	-0.06 (-0.21, 0.09)
	Isoleucine	-0.16 (-0.61, 0.30)	-0.69 (-1.12, -0.25)	-0.48 (-0.89, -0.06)	-0.74 (-1.17, -0.31)	-0.20 (-0.44, 0.04)	-0.46 (-0.90, -0.03)
	Leucine	-0.05 (-0.50, 0.39)	-0.53 (-0.96, -0.10)	-0.34 (-0.75, 0.07)	-0.64 (-1.07, -0.22)	-0.06 (-0.29, 0.16)	-0.20 (-0.61, 0.20)
	Valine	0.06 (-0.17, 0.29)	-0.21 (-0.43, 0.01)	-0.10 (-0.31, 0.10)	-0.15 (-0.36, 0.07)	0.04 (-0.08, 0.15)	0.06 (-0.15, 0.28)
	Glutamine	0.11 (-0.05, 0.27)	0.12 (-0.03, 0.27)	0.13 (-0.01, 0.27)	0.11 (-0.04, 0.26)	0.07 (-0.01, 0.14)	0.11 (-0.02, 0.25)
	Histidine	0.13 (-0.88, 1.13)	-0.62 (-1.59, 0.35)	-0.12 (-1.03, 0.80)	-0.08 (-1.03, 0.88)	0.57 (0.01, 1.12)	0.96 (-0.07, 1.98)
	Phenylalanine	-1.13 (-2.06, -0.20)	-1.65 (-2.54, -0.76)	-1.02 (-1.85, -0.18)	-1.37 (-2.25, -0.49)	-0.46 (-0.93, 0.02)	-1.04 (-1.91, -0.17)
	Tyrosine	-0.41 (-1.00, 0.18)	-0.96 (-1.53, -0.39)	-0.47 (-1.00, 0.07)	-0.66 (-1.22, -0.10)	0.07 (-0.27, 0.41)	0.05 (-0.58, 0.67)

	Creatinine	0.57 (-0.69, 1.83)	0.39 (-0.82, 1.60)	0.29 (-0.84, 1.43)	0.51 (-0.68, 1.70)	0.68 (0.19, 1.17)	1.31 (0.41, 2.21)
	Albumin	1.03 (-0.70, 2.75)	1.43 (-0.23, 3.09)	2.04 (0.49, 3.59)	2.08 (0.45, 3.71)	1.09 (0.14, 2.03)	1.64 (-0.11, 3.39)
	GlycA	0.00 (-0.04, 0.05)	-0.05 (-0.10, -0.01)	-0.05 (-0.09, -0.01)	-0.09 (-0.14, -0.05)	-0.04 (-0.06, -0.02)	-0.11 (-0.15, -0.07)
<i>Adjusted coefficient (95% CI)</i>							
Group	Metabolite	Child				Adult	
		CHU9D	PedsQL-PS	PedsQL-GW	ISCWeb	CHU9D	AQoL8D-PS
Lipids, Cholesterol and Triglycerides	Total cholesterol	0.00 (-0.01, 0.02)	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.02)	0.00 (-0.01, 0.01)	0.01 (-0.00, 0.01)	0.01 (-0.00, 0.02)
	Remnant cholesterol	-0.00 (-0.04, 0.03)	-0.02 (-0.05, 0.01)	0.00 (-0.02, 0.03)	-0.03 (-0.06, 0.00)	-0.00 (-0.01, 0.01)	-0.01 (-0.03, 0.02)
	Esterified cholesterol	0.00 (-0.02, 0.02)	0.00 (-0.02, 0.02)	0.01 (-0.00, 0.03)	0.00 (-0.01, 0.02)	0.01 (-0.00, 0.02)	0.01 (-0.00, 0.03)
	Free cholesterol	0.01 (-0.03, 0.06)	0.01 (-0.03, 0.06)	0.04 (-0.00, 0.08)	0.02 (-0.03, 0.06)	0.02 (-0.00, 0.04)	0.03 (-0.01, 0.06)
	Total triglycerides	-0.00 (-0.02, 0.01)	-0.02 (-0.04, -0.00)	-0.01 (-0.03, 0.00)	-0.04 (-0.05, -0.02)	-0.01 (-0.01, 0.00)	-0.02 (-0.03, -0.00)
	Total phosphoglycerides	-0.01 (-0.04, 0.02)	-0.02 (-0.05, 0.01)	0.01 (-0.02, 0.04)	-0.03 (-0.06, 0.00)	0.01 (-0.00, 0.03)	0.02 (-0.01, 0.04)
	VLDL diameter	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	-0.01 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.01, -0.00)	-0.01 (-0.02, -0.00)
	xL VLDL lipids	-0.14 (-0.40, 0.13)	-0.32 (-0.57, -0.08)	-0.21 (-0.44, 0.03)	-0.51 (-0.75, -0.27)	-0.12 (-0.24, 0.01)	-0.28 (-0.50, -0.05)
	vL VLDL lipids	-0.05 (-0.17, 0.06)	-0.14 (-0.25, -0.03)	-0.09 (-0.20, 0.01)	-0.23 (-0.34, -0.12)	-0.05 (-0.11, 0.00)	-0.13 (-0.22, -0.03)
	L VLDL lipids	-0.01 (-0.05, 0.03)	-0.04 (-0.08, -0.00)	-0.03 (-0.07, 0.01)	-0.08 (-0.12, -0.04)	-0.02 (-0.03, 0.00)	-0.04 (-0.08, -0.01)
	M VLDL lipids	-0.01 (-0.04, 0.03)	-0.03 (-0.06, 0.00)	-0.02 (-0.05, 0.01)	-0.06 (-0.09, -0.03)	-0.01 (-0.03, 0.00)	-0.03 (-0.06, -0.01)
	S VLDL lipids	-0.00 (-0.06, 0.06)	-0.05 (-0.11, 0.01)	-0.02 (-0.08, 0.03)	-0.09 (-0.15, -0.04)	-0.01 (-0.04, 0.01)	-0.05 (-0.09, -0.00)
	vS VLDL lipids	0.03 (-0.08, 0.14)	0.01 (-0.10, 0.12)	0.07 (-0.03, 0.17)	0.01 (-0.09, 0.12)	0.01 (-0.03, 0.06)	-0.01 (-0.09, 0.08)
	VLDL cholesterol	-0.01 (-0.06, 0.04)	-0.04 (-0.08, 0.00)	-0.01 (-0.06, 0.03)	-0.07 (-0.12, -0.03)	-0.01 (-0.03, 0.01)	-0.03 (-0.06, 0.01)
	VLDL triglycerides	-0.00 (-0.02, 0.02)	-0.02 (-0.04, -0.00)	-0.02 (-0.03, 0.00)	-0.04 (-0.06, -0.02)	-0.01 (-0.02, 0.00)	-0.02 (-0.04, -0.01)
	LDL diameter	-0.02 (-0.10, 0.06)	0.04 (-0.04, 0.11)	0.01 (-0.06, 0.08)	0.02 (-0.05, 0.10)	-0.02 (-0.07, 0.03)	0.03 (-0.06, 0.13)
	L LDL lipids	0.01 (-0.03, 0.04)	0.01 (-0.03, 0.04)	0.02 (-0.01, 0.06)	0.01 (-0.02, 0.05)	0.01 (-0.01, 0.03)	0.02 (-0.01, 0.05)
	M LDL lipids	0.01 (-0.05, 0.07)	0.00 (-0.05, 0.06)	0.04 (-0.01, 0.09)	0.02 (-0.03, 0.08)	0.02 (-0.01, 0.04)	0.02 (-0.03, 0.07)
S LDL lipids	0.03 (-0.07, 0.12)	0.01 (-0.08, 0.10)	0.06 (-0.03, 0.14)	0.04 (-0.05, 0.13)	0.03 (-0.01, 0.07)	0.04 (-0.04, 0.12)	

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	LDL cholesterol	0.00 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.02 (-0.01, 0.04)	0.01 (-0.01, 0.03)	0.01 (-0.00, 0.02)	0.01 (-0.01, 0.03)
	LDL triglycerides	-0.05 (-0.38, 0.27)	-0.07 (-0.37, 0.24)	0.10 (-0.19, 0.39)	-0.31 (-0.61, -0.00)	0.03 (-0.08, 0.14)	-0.01 (-0.21, 0.19)
	IDL lipids	0.00 (-0.04, 0.05)	0.01 (-0.04, 0.05)	0.03 (-0.01, 0.07)	0.01 (-0.03, 0.05)	0.01 (-0.01, 0.03)	0.02 (-0.02, 0.06)
	IDL cholesterol	0.01 (-0.06, 0.07)	0.01 (-0.05, 0.07)	0.04 (-0.01, 0.10)	0.03 (-0.03, 0.09)	0.02 (-0.01, 0.05)	0.03 (-0.02, 0.09)
	IDL triglycerides	0.12 (-0.44, 0.67)	0.13 (-0.40, 0.65)	0.23 (-0.27, 0.72)	-0.26 (-0.78, 0.26)	0.01 (-0.18, 0.19)	-0.09 (-0.42, 0.25)
	HDL diameter	-0.01 (-0.05, 0.03)	0.02 (-0.02, 0.06)	0.03 (-0.01, 0.06)	0.02 (-0.01, 0.06)	0.02 (-0.00, 0.04)	0.05 (0.01, 0.09)
	vL HDL lipids	-0.01 (-0.06, 0.03)	0.02 (-0.02, 0.06)	0.03 (-0.01, 0.07)	0.02 (-0.02, 0.06)	0.02 (-0.00, 0.04)	0.05 (0.01, 0.09)
	L HDL lipids	0.00 (-0.03, 0.03)	0.02 (-0.01, 0.05)	0.03 (-0.00, 0.05)	0.03 (-0.00, 0.05)	0.02 (0.00, 0.03)	0.04 (0.01, 0.06)
	M HDL lipids	0.05 (-0.01, 0.11)	0.04 (-0.02, 0.10)	0.02 (-0.04, 0.08)	0.04 (-0.02, 0.10)	0.02 (-0.01, 0.05)	0.04 (-0.01, 0.09)
	S HDL lipids	0.09 (0.02, 0.16)	0.05 (-0.02, 0.12)	0.01 (-0.05, 0.08)	0.03 (-0.03, 0.10)	0.02 (-0.02, 0.05)	0.01 (-0.05, 0.07)
	HDL1 cholesterol	0.01 (-0.02, 0.04)	0.02 (-0.01, 0.05)	0.03 (-0.00, 0.06)	0.03 (-0.00, 0.06)	0.02 (0.01, 0.03)	0.04 (0.01, 0.07)
	HDL2 cholesterol	0.01 (-0.02, 0.04)	0.02 (-0.01, 0.06)	0.03 (-0.00, 0.06)	0.03 (-0.00, 0.06)	0.02 (0.01, 0.04)	0.04 (0.01, 0.07)
	HDL3 cholesterol	0.03 (-0.33, 0.38)	0.19 (-0.15, 0.52)	0.28 (-0.04, 0.60)	0.12 (-0.21, 0.45)	0.23 (0.07, 0.38)	0.34 (0.06, 0.62)
	HDL triglycerides	-0.10 (-0.39, 0.19)	-0.17 (-0.44, 0.10)	-0.09 (-0.35, 0.17)	-0.48 (-0.75, -0.21)	-0.01 (-0.14, 0.11)	-0.08 (-0.30, 0.15)
Fatty Acids and Cholines	Total fatty acids	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.00)	0.00 (-0.00, 0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.01, 0.00)
	Saturated fatty acids	-0.01 (-0.02, 0.01)	-0.01 (-0.02, 0.00)	-0.00 (-0.01, 0.01)	-0.02 (-0.03, -0.01)	-0.00 (-0.01, 0.00)	-0.00 (-0.01, 0.01)
	Saturated:total FAs	-0.01 (-0.01, -0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.01, 0.00)	-0.00 (-0.00, 0.00)	-0.00 (-0.01, 0.00)
	Degree of unsaturation	0.10 (-0.04, 0.24)	0.14 (0.01, 0.27)	0.14 (0.01, 0.27)	0.26 (0.13, 0.39)	0.15 (0.07, 0.23)	0.23 (0.09, 0.38)
	Monounsaturated fatty acids	-0.00 (-0.02, 0.01)	-0.01 (-0.03, -0.00)	-0.01 (-0.02, 0.01)	-0.03 (-0.04, -0.01)	-0.00 (-0.01, 0.00)	-0.01 (-0.02, 0.00)
	Monounsaturated:total FAs	-0.00 (-0.01, 0.00)	-0.00 (-0.01, -0.00)	-0.00 (-0.01, -0.00)	-0.01 (-0.01, -0.00)	-0.00 (-0.00, -0.00)	-0.01 (-0.01, -0.00)
	Polyunsaturated fatty acids	0.01 (-0.01, 0.02)	0.00 (-0.01, 0.02)	0.01 (-0.00, 0.02)	-0.00 (-0.02, 0.01)	0.00 (-0.00, 0.01)	0.01 (-0.01, 0.02)
	Polyunsaturated:total FAs	0.00 (-0.00, 0.01)	0.00 (0.00, 0.01)	0.00 (-0.00, 0.00)	0.00 (0.00, 0.01)	0.00 (0.00, 0.00)	0.00 (0.00, 0.01)
	Omega3 fatty acids	0.07 (-0.03, 0.17)	0.06 (-0.04, 0.15)	0.10 (0.01, 0.18)	0.01 (-0.08, 0.10)	0.04 (0.00, 0.08)	0.05 (-0.03, 0.12)
	Omega3:total FAs	0.01 (-0.00, 0.03)	0.02 (0.00, 0.03)	0.02 (0.01, 0.03)	0.02 (0.01, 0.03)	0.01 (0.01, 0.02)	0.02 (0.01, 0.03)
	22:6, docosahexaenoic acid	0.16 (-0.13, 0.46)	0.23 (-0.05, 0.50)	0.35 (0.09, 0.60)	0.25 (-0.02, 0.53)	0.18 (0.05, 0.30)	0.16 (-0.06, 0.38)

	Docosahexaenoic:total FAs	0.02 (-0.02, 0.05)	0.03 (0.00, 0.07)	0.04 (0.01, 0.07)	0.05 (0.02, 0.08)	0.03 (0.02, 0.05)	0.04 (0.01, 0.07)
	Omega6 fatty acids	0.01 (-0.01, 0.03)	0.00 (-0.01, 0.02)	0.01 (-0.01, 0.02)	-0.01 (-0.02, 0.01)	0.00 (-0.00, 0.01)	0.01 (-0.01, 0.02)
	Omega6:total FAs	0.00 (-0.00, 0.01)	0.00 (0.00, 0.01)	0.00 (-0.00, 0.00)	0.00 (0.00, 0.01)	0.00 (-0.00, 0.00)	0.00 (0.00, 0.01)
	18:2, linoleic acid	0.01 (-0.01, 0.03)	0.00 (-0.01, 0.02)	0.00 (-0.01, 0.02)	-0.01 (-0.02, 0.01)	0.00 (-0.01, 0.01)	0.01 (-0.01, 0.02)
	Linoleic:total FAs	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (-0.00, 0.00)	0.00 (0.00, 0.01)	0.00 (-0.00, 0.00)	0.00 (0.00, 0.01)
	Total cholines	-0.00 (-0.03, 0.03)	-0.01 (-0.04, 0.02)	0.02 (-0.01, 0.05)	-0.01 (-0.04, 0.02)	0.02 (0.00, 0.03)	0.02 (-0.00, 0.05)
	Phosphatidylcholine	-0.01 (-0.04, 0.03)	-0.02 (-0.05, 0.02)	0.01 (-0.02, 0.04)	-0.02 (-0.05, 0.01)	0.01 (-0.00, 0.03)	0.02 (-0.01, 0.05)
	Sphingomyelins	0.06 (-0.07, 0.19)	0.07 (-0.06, 0.19)	0.13 (0.01, 0.25)	0.09 (-0.04, 0.21)	0.05 (-0.01, 0.11)	0.10 (-0.01, 0.22)
Other	ApoA1	0.01 (-0.04, 0.07)	0.02 (-0.03, 0.07)	0.04 (-0.01, 0.09)	0.02 (-0.04, 0.07)	0.03 (0.01, 0.06)	0.05 (0.01, 0.10)
	ApoB	-0.00 (-0.07, 0.06)	-0.03 (-0.09, 0.03)	0.00 (-0.05, 0.06)	-0.06 (-0.12, -0.00)	-0.00 (-0.03, 0.02)	-0.02 (-0.07, 0.02)
	ApoB:ApoA1	-0.02 (-0.11, 0.07)	-0.06 (-0.15, 0.02)	-0.03 (-0.11, 0.05)	-0.11 (-0.19, -0.02)	-0.03 (-0.07, 0.01)	-0.08 (-0.15, -0.01)
	Pyruvate	-0.27 (-0.61, 0.08)	-0.47 (-0.80, -0.15)	-0.24 (-0.55, 0.07)	-0.32 (-0.65, 0.00)	-0.16 (-0.32, 0.00)	-0.25 (-0.54, 0.04)
	Citrate	0.10 (-0.37, 0.58)	0.11 (-0.34, 0.56)	0.18 (-0.24, 0.60)	0.21 (-0.24, 0.65)	-0.10 (-0.39, 0.20)	0.03 (-0.51, 0.57)
	Glycerol	0.32 (-0.21, 0.85)	0.19 (-0.32, 0.69)	0.26 (-0.22, 0.75)	-0.06 (-0.54, 0.41)	-0.12 (-0.51, 0.28)	-0.31 (-1.02, 0.40)
	Acetate	1.11 (-0.41, 2.63)	0.11 (-1.33, 1.55)	0.55 (-0.80, 1.90)	1.04 (-0.38, 2.46)	-0.12 (-0.25, 0.01)	-0.25 (-0.48, -0.02)
	Acetoacetate	0.05 (-0.40, 0.49)	0.35 (-0.07, 0.77)	0.14 (-0.26, 0.53)	0.19 (-0.23, 0.60)	-0.04 (-0.28, 0.19)	-0.30 (-0.73, 0.13)
	3hydroxybutyrate	0.03 (-0.07, 0.12)	0.07 (-0.02, 0.16)	0.05 (-0.03, 0.13)	0.07 (-0.02, 0.15)	-0.03 (-0.09, 0.02)	-0.09 (-0.20, 0.01)
	Alanine	-0.10 (-0.24, 0.04)	-0.19 (-0.32, -0.06)	-0.04 (-0.17, 0.08)	-0.13 (-0.27, -0.00)	0.03 (-0.06, 0.11)	0.06 (-0.09, 0.20)
	Glycine	-0.18 (-0.44, 0.08)	-0.27 (-0.51, -0.02)	-0.15 (-0.39, 0.08)	-0.29 (-0.53, -0.05)	0.00 (-0.08, 0.09)	-0.06 (-0.21, 0.09)
	Isoleucine	-0.12 (-0.58, 0.35)	-0.56 (-1.00, -0.12)	-0.22 (-0.64, 0.19)	-0.54 (-0.98, -0.11)	-0.10 (-0.36, 0.16)	-0.17 (-0.63, 0.29)
	Leucine	-0.02 (-0.48, 0.44)	-0.39 (-0.83, 0.04)	-0.06 (-0.47, 0.35)	-0.42 (-0.85, 0.01)	0.00 (-0.23, 0.24)	0.01 (-0.41, 0.44)
	Valine	0.08 (-0.15, 0.32)	-0.15 (-0.37, 0.08)	0.03 (-0.18, 0.24)	-0.04 (-0.26, 0.18)	0.07 (-0.06, 0.19)	0.13 (-0.09, 0.36)
	Glutamine	0.09 (-0.07, 0.26)	0.05 (-0.11, 0.20)	0.05 (-0.10, 0.20)	0.03 (-0.12, 0.18)	0.01 (-0.06, 0.09)	-0.01 (-0.15, 0.13)
	Histidine	0.11 (-0.90, 1.13)	-0.56 (-1.51, 0.40)	0.06 (-0.84, 0.97)	0.03 (-0.91, 0.98)	0.36 (-0.20, 0.92)	0.39 (-0.62, 1.39)
	Phenylalanine	-1.16 (-2.11, -0.20)	-1.52 (-2.42, -0.62)	-0.54 (-1.39, 0.30)	-1.03 (-1.92, -0.13)	0.02 (-0.49, 0.52)	0.10 (-0.82, 1.01)

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Tyrosine	-0.43 (-1.03, 0.16)	-0.91 (-1.47, -0.35)	-0.34 (-0.87, 0.19)	-0.56 (-1.12, -0.01)	0.16 (-0.19, 0.50)	0.28 (-0.35, 0.90)
Creatinine	0.65 (-0.62, 1.92)	0.63 (-0.57, 1.83)	0.67 (-0.46, 1.79)	0.88 (-0.30, 2.06)	0.42 (-0.13, 0.96)	0.69 (-0.30, 1.67)
Albumin	0.99 (-0.80, 2.78)	0.80 (-0.89, 2.49)	1.47 (-0.11, 3.05)	1.56 (-0.11, 3.22)	0.43 (-0.54, 1.40)	-0.27 (-2.04, 1.50)
GlycA	0.01 (-0.03, 0.06)	-0.04 (-0.08, 0.01)	-0.00 (-0.05, 0.04)	-0.07 (-0.11, -0.02)	-0.01 (-0.04, 0.01)	-0.05 (-0.09, -0.01)

xL, extra large; vL, very large; L, large; M, medium; S, small; vS, very small; VLDL, very low density lipoproteins; LDL, low density lipoproteins; IDL, intermediate density lipoproteins; HDL, high density lipoproteins; FAs, fatty acids; ApoA1, Apolipoprotein A1; ApoB, Apolipoprotein B; GlycA, Glycoprotein acetyls.

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