**Supplementary Digital Content 3, Table 1**. Associations between PCA Factors with LP/Lean.

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|  | **Component Loadings** | **Β ± SE** | **p-value** | **q-value** |
| **C1-C6 PCA on 76 metabolites** |  |  |  |  |
| **C1-C6 F1:** glycerate, erythronate, erythrulose, glutamate, aspartateoxalate, threonine, ascorbate, cysteine, | 0.87, 0.80, 0.72, 0.71, 0.67, -0.66, -0.81, -0.88, -0.92 | -1.4 ± 0.9 | 0.12 | 0.46 |
| **C1-C6 F2:** choline, 5-oxoproline, glycerol, glutamine | 0.94, 0.89, 0.80, -0.79 | 0.4 ± 0.8 | 0.60 | 0.60 |
| **C1-C6 F3:** isoleucine, leucine, valine, methionine | 0.93, 0.89, 0.87, 0.62 | 1.9 ± 0.8 | 0.02 | 0.20 |
| **C1-C6 F4:** N-acetylalanine, N-acetylserine, N-acetylthreonine, N-formylmethionine | 0.91, 0.81, 0.64, 0.58 | 0.6 ± 0.8 | 0.48 | 0.56 |
| **C1-C6 F5:** 4-methyl-2-oxopentanoate, 3-methyl-2-oxobutyrate, 3-methyl-2-oxovalerate | 0.87, 0.82, 0.78 | 0.8 ± 0.8 | 0.31 | 0.52 |
| **C1-C6 F6:** acetylphosphate, methylphosphate, asparagine | 0.92, 0.84, -0.60 | 0.2 ± 0.8 | 0.81 | 0.67 |
| **C1-C6 F7:** pyroglutamine, creatine, | 0.88, -0.70 | 0.4 ± 0.9 | 0.64 | 0.62 |
| **C1-C6 F8:** pyruvate, α-ketoglutarate | 0.86, 0.68 | -1.6 ± 0.8 | 0.05 | 0.43 |
| **C1-C6 F9:** glycine | 0.82 | -0.8 ± 0.8 | 0.32 | 0.52 |
| **C1-C6 F10:** glycolate,trans-4-hydroxyproline | 0.83, 0.72 | -1.3 ± 0.8 | 0.12 | 0.46 |
| **C1-C6 F11:** threonine | 0.86 | 0.2 ± 0.8 | 0.83 | 0.67 |
| **C1-C6 F12:** 3-hydroxybutyrate | 0.83 | -0.2 ± 0.8 | 0.77 | 0.66 |
| **C1-C6 F13:** pipecolate | 0.92 | 0.8 ± 0.8 | 0.33 | 0.52 |
| **C1-C6 F14:** catechol sulfate | 0.87 | 1.0 ± 0.8 | 0.22 | 0.51 |
| **C1-C6 F15:** lactate | 0.89 | 1.4 ± 0.8 | 0.08 | 0.46 |
| **C1-C6 F16:** α-hydroxyisocaproate | 0.86 | -1.3 ± 0.8 | 0.13 | 0.46 |
| **C1-C6 F17:** dimethylglycine | 0.90 | 0.5 ± 0.8 | 0.59 | 0.60 |
| **C1-C6 F18:** succinate | 0.93 | -0.2 ± 0.8 | 0.76 | 0.66 |
| **C1-C6 F19:** citrate | 0.87 | -0.4 ± 0.8 | 0.61 | 0.60 |
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| **C1-C6 PCA on 21 metabolites** |  |  |  |  |
| **C1-C6 F1:** glycerol-3-phosphate, glycerol-2-phosphate | 0.94, 0.89 | 0.0 **±** 0.8 | 1.00 | 0.72 |
| **C1-C6 F2:** mannose, glucose | 0.95, 0.75  | -1.0 ± 0.8 | 0.21 | 0.51 |
| **C1-C6 F3:** myo-inositol, arabitol | 0.92, 0.67 | 0.7 ± 0.8 | 0.38 | 0.53 |
| **C1-C6 F4:** mannitol | 0.91 | 0.0 ± 0.8 | 0.99 | 0.72 |
| **C1-C6 F5:** arabinose | 0.96 | 1.0 ± 0.8 | 0.21 | 0.51 |
| **C1-C6 F6:** fructose | 0.98 | 1.1 ± 0.8 | 0.18 | 0.51 |
| **C1-C6 F7:** hypoxanthine | 0.94 | 1.3 ± 0.8 | 0.12 | 0.46 |
|  |  |  |  |  |
| **C7-C11 PCA on 76 metabolites** |  |  |  |  |
| **C7-C11 F1:** γ-glutamylleucine, γ-glutamylvaline, γ-glutamylmethionine, γ-glutamylisoleucine, γ-glutamylthreonine, γ-glutamyl-2-aminobutyrate, γ-glutamylglutamine, indolepyruvate | 0.94, 0.94, 0.90, 0.90, 0.64, 0.59, 0.52, -0.59 | -0.8 **±** 0.8 | 0.35 | 0.52 |
| **C7-C11 F2:** perlagonate, caprylate, caprate, heptanoate, undecanoate | 0.96, 0.96, 0.94, 0.94, 0.90 | -0.5 **±** 0.8 | 0.57 | 0.60 |
| **C7-C11 F3:** 1,7-dimethylurate, theophylline, caffeine, 1,3,7-trimethylurate | 0.94, 0.92, 0.90, 0.83 | -0.6 **±** 0.8 | 0.48 | 0.56 |
| **C7-C11 F4:** phenyllactate,3-(4-hydroxyphenyl)lactate, indolelactate | 0.83, 0.82, 0.79 | 1.1 **±** 0.9 | 0.22 | 0.51 |
| **C7-C11 F5:** hydrocinnamate, cinnamoylglycine, hippurate, indolepropionate | 0.92, 0.85, 0.60, 0.58 | -1.9 **±** 0.8 | 0.02 | 0.20 |
| **C7-C11 F6:** 3-hydroxyoctanoate, 3-hydroxydecanoate | 0.94, 0.87 | 0.9 **±** 0.8 | 0.27 | 0.52 |
| **C7-C11 F7:** tryptophan, phenylalanine, tyrosine | 0.86, 0.69, 0.57 | 1.0 **±** 0.8 | 0.24 | 0.51 |
| **C7-C11 F8:** pyridoxate, pantothenate | 0.81, 0.76 | -0.1 **±** 0.8 | 0.86 | 0.68 |
| **C7-C11 F9:** carnitine | 0.86 | -0.3 **±** 0.8 | 0.75 | 0.66 |
| **C7-C11 F10:** serotonin | 0.91 | -1.2 **±** 0.8 | 0.14 | 0.46 |
| **C7-C11 F11:** none | - | 0.6 **±** 0.8 | 0.46 | 0.55 |
| **C7-C11 F12:** glycerophosphorylcholine | 0.93 | -0.9 **±** 0.8 | 0.29 | 0.52 |
| **C7-C11 F13:** phenylacetate | 0.92 | 0.4 **±** 0.9 | 0.65 | 0.62 |
| **C7-C11 F14:** N-acetylmethionine | 0.88 | 1.0 **±** 0.8 | 0.22 | 0.52 |
| **C7-C11 F15:** 3-methoxytryosine | 0.92 | 1.3 **±** 0.8 | 0.10 | 0.46 |
| **C7-C11 F16:** 3-methoxytyramine | 0.95 | -0.1 **±** 0.8 | 0.89 | 0.69 |
| **C7-C11 F17:** homostachydrine | 0.90 | 0.8 **±** 0.8 | 0.31 | 0.52 |
| **C7-C11 F18:** dimethylarginine | 0.89 | -1.3 **±** 0.8 | 0.10 | 0.46 |
| **C7-C11 F19:** stachydrine | 0.89 | 0.1 **±** 0.8 | 0.91 | 0.69 |
| **C7-C11 F20:** succinylcarnitine | 0.92 | 0.6 **±** 0.8 | 0.46 | 0.55 |
| **C7-C11 F21:** butyrylcarnitine | 0.89 | 0.4 **±** 0.8 | 0.60 | 0.60 |
|  |  |  |  |  |
| **C12-C19 PCA on 53 metabolites** |  |  |  |  |
| **C12-C19 F1:** oleate,10-nonadecanoate, palmitate, palmitoleate, 10-heptadecanoate, margarate, myristoleate, stearate, linoleate, myristate, nonadecanoate, 5-dodecanoate, linolenate, methyl palmitate, pentadecanoate, stearidonate, 17-methylstearate, adrenate | 0.94, 0.94, 0.92, 0.92, 0.92, 0.92, 0.91, 0.90, 0.89, 0.89, 0.86, 0.83, 0.77, 0.76, 0.76, 0.72, 0.71, 0.66 | 0.2 **±** 0.8 | 0.78 | 0.66 |
| **C12-C19 F2:** cis-4-decenoylcarnitine, octanoylcarnitine, decanoylcarnitine, hexanoylcarnitine, laurylcarnitine | 0.92, 0.91, 0.90, 0.83, 0.75 | 0.8 **±** 0.8 | 0.36 | 0.52 |
| **C12-C19 F3:** androsterone sulfate, epiandrosterone sulfate | 0.92, 0.91 | 0.2 **±** 0.8 | 0.84 | 0.67 |
| **C12-C19 F4:** phenylalanylphenylalanine,aspartylphenylalanine, leucylleucine | 0.94, 0.93, 0.62 | -1.1 **±** 0.8 | 0.21 | 0.51 |
| **C12-C19 F5:** methyl stearate,palmitate methyl ester, | 0.95, 0.84 | 0.8 **±** 0.8 | 0.35 | 0.52 |
| **C12-C19 F6:** 4-androsten-3beta,17beta-diol disulfate | 0.92 | 0.7 **±** 0.8 | 0.44 | 0.55 |
| **C12-C19 F7:** 2-hydroxypalmitate, 2-hydroxystearate | 0.79, 0.62 | 1.4 **±** 0.8 | 0.10 | 0.46 |
| **C12-C19 F8:** hexadecanedioate, tetradecanedioate | 0.80, 0.68 | -0.2 **±** 0.8 | 0.82 | 0.67 |
| **C12-C19 F9:** γ-glutamylphenylalanine | 0.89 | 0.6 **±** 0.8 | 0.44 | 0.55 |
| **C12-C19 F10:** dodecanedioate | 0.92 | 0.0 **±** 0.8 | 0.99 | 0.72 |
| **C12-C19 F11:** andro steroid monosulfate | 0.92 | -0.9 **±** 0.8 | 0.30 | 0.52 |
| **C12-C19 F12:** methylglutarylcarnitine | 0.94 | -2.0 **±** 0.8 | 0.01 | 0.20 |
|  |  |  |  |  |
| **C20-C30 PCA on 63 metabolites** |  |  |  |  |
| **C20-C30 F1:** 2-stearoylglycerophosphocholine, 1-stearoylglycerophosphocholine, 1-palmitoylglycerophosphocholine, 1-heptadecanoylglycerophosphocholine, 2-oleoylglycerophosphocholine, 1-oleoylglycerophosphocholine, 1-eicosadienoylglycerophosphocholine, 2-palmitoylglycerophosphocholine, 1-eicosatrienoylglycerophosphocholine | 0.94, 0.93, 0.91, 0.88, 0.83, 0.81, 0.78, 0.78 0.66 | 0.4 **±** 0.8 | 0.59 | 0.60 |
| **C20-C30 F2:** dihomo-linoleate, docosapentaenoate, eicosenoate, dihomo-linolenate, docosahexaenoate, eicosapentaenoate |  0.90, 0.90, 0.85, 0.78, 0.72, 0.62 | 0.3 **±** 0.8 | 0.72 | 0/64 |
| **C20-C30 F3:** 2-linoleoylglycerophosphoethanolamine, 1-linoleoylglycerophosphoethanolamine, 1-oleoylglycerophosphoethanolamine, 1-linoleoylglycerophosphocholine, 2-linoleoylglycerophosphocholine, 2-oleoylglycerophosphoethanolamine | 0.89, 0.86, 0.73, 0.61, 0.58, 0.51 | -0.0 **±** 0.9 | 0.98 | 0.72 |
| **C20-C30 F4:** taurocholate, glycocholate, glycochenodeoxycholate, taurochenodeoxycholate, glycoursodeoxycholate | 0.88, 0.86, 0.83, 0.83, 0.54 | 1.0 **±** 0.8 | 0.21 | 0.51 |
| **C20-C30 F5:**  2-palmitoylglycerophosphoethanolamine, 1-palmitoylglycerophosphoethanolamine, 1-stearoylglycerophosphoethanolamine, cortisol | 0.90, 0.82, 0.59, 0.54 | -0.8 **±** 0.8 | 0.33 | 0.52 |
| **C20-C30 F6:** glycolithocholate sulfate, taurolithocholate 3-sulfate | 0.90, 0.83 | -1.0 **±** 0.8 | 0.23 | 0.51 |
| **C20-C30 F7:** 1-arachidonoylglycerophosphoinositol | 0.90 | 0.6 **±** 0.8 | 0.45 | 0.55 |
| **C20-C30 F8:** 1-palmitoylplasmenylethanolamine | 0.95 | 0.5 **±** 0.8 | 0.56 | 0.60 |
| **C20-C30 F9:** 1-arachidonoylglycerophosphocholine | 0.88 | -0.9 **±** 0.8 | 0.25 | 0.52 |
| **C20-C30 F10:** 1-docosapentaenoylglycerophosphocholine | 0.93 | 1.6 **±** 0.8 | 0.05 | 0.43 |
| **C20-C30 F11:** stearoylcarnitine | 0.88 | -0.4 **±** 0.8 | 0.67 | 0.62 |
| **C20-C30 F12:** oleoylcarnitine | 0.87 | 1.5 **±** 0.8 | 0.06 | 0.43 |
| **C20-C30 F13:** glycocholenate sulfate | 0.93 | 0.4 **±** 0.8 | 0.65 | 0.62 |
| **C20-C30 F14:** taurocholenate sulfate | 0.95 | -0.5 **±** 0.8 | 0.58 | 0.60 |

Sex-adjusted associations between PCA factors with LP/Lean are shown with component loadings for metabolites≥0.5 and ≤-0.5, parameter estimates and standard errors (β ± SE), in order of significance (p-value) and, with false discovery rates (q-values).