# Supplementary Materials

## Serum Fatty Acid Profiles across Normoglycemia, Prediabetes, and Type 2 Diabetes: Associations with Glycemic and Cardiometabolic Parameters in a Kazakh Population

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## Figure S1. Participant flow

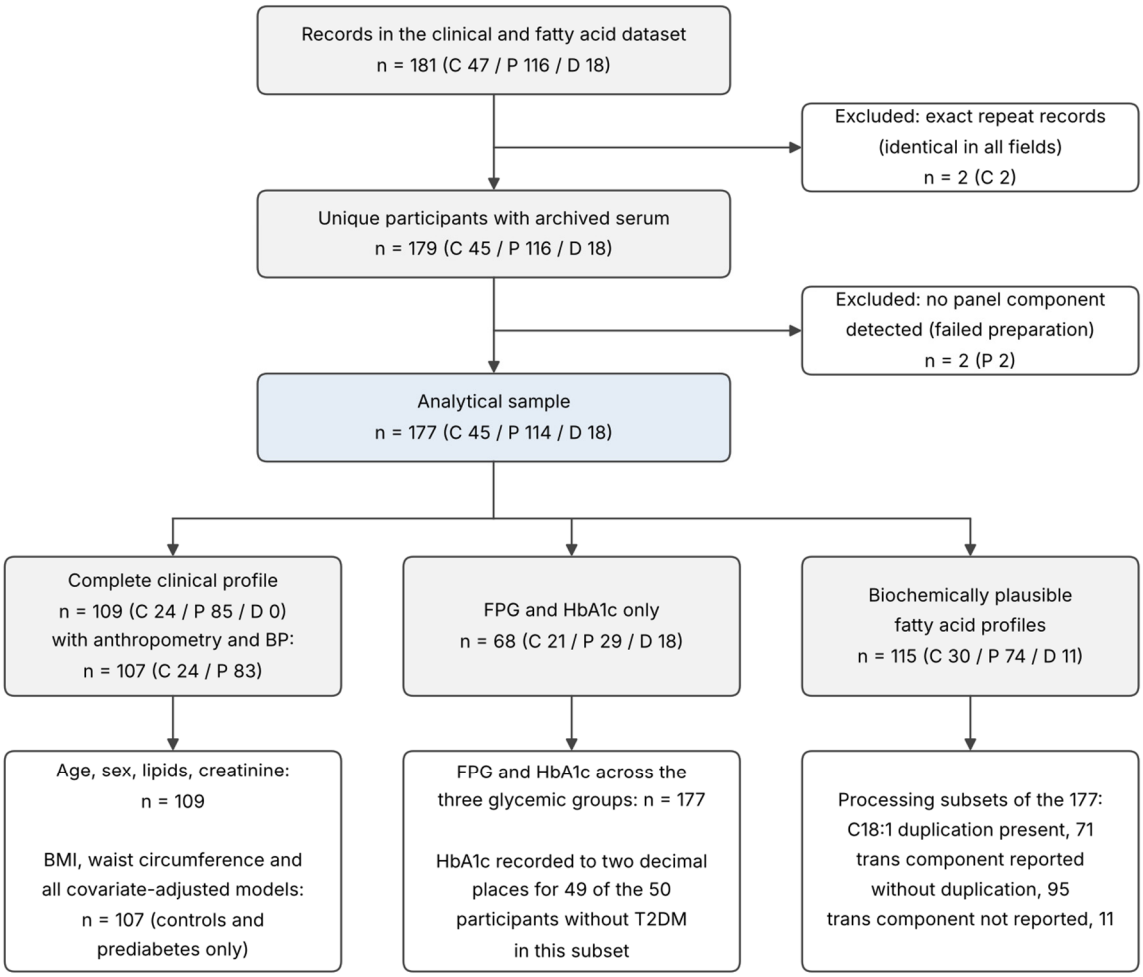



**Figure S1.** Construction of the analytical sample and of the subsets used in the analyses. Exact repeat records had an identical sample identifier and identical values in every clinical and fatty acid field and were retained once. No clinical variable other than fasting plasma glucose (FPG) and glycated hemoglobin (HbA1c) was recorded for any participant with T2DM. The plausible profiles and the processing subsets are defined in Note S1. BP, blood pressure; BMI, body mass index.

## Note S1. Analytical procedure and data checks

### S1.1. Instrument and processing parameters

Serum fatty acids were determined as fatty acid methyl esters on a TRACE 1300 gas chromatograph coupled to a TSQ series mass spectrometer (Thermo Fisher Scientific) with a TR-FAME column (60 m × 0.25 mm × 0.25 μm), electron ionization and full-scan acquisition (m/z 30–550); sample preparation and chromatographic conditions are given in Section 4.4 of the main text. Data were processed in Thermo Xcalibur with an external-standard processing method in which every component was quantified on the total ion current (TIC) trace. The parameters applied to all 37 components were: peak detection by the ICIS algorithm (smoothing 7 points, baseline window 40 scans, area and peak noise factors 10, minimum peak height S/N 3.0); no retention-time reference and no adjustment of expected retention times; ion-ratio confirmation and spectral library matching disabled; response measured as peak area; single calibration level; linear calibration forced through the origin; equal weighting; units μg/mL ("mcg/ml" in the method). The identification window was 30 s for every component except C4:0 (10 s). Thirty-one components were assigned to the highest peak within their window and six (C18:1n-9 trans, C18:3n-6, C21:0, C20:2n-6, C20:3n-6 and C22:1n-9) to the peak nearest to the expected retention time (Table S1A). In the processing method, C20:3n-6 (dihomo-γ-linolenic acid, cis-8,11,14) is labelled "C20:3_n3_cis_8,11,14"; the label refers to the n-6 isomer, as its double-bond positions show.

### S1.2. Calibration, limits and composition

Sample values were obtained from a single-level calibration of each component against the certified 37-component FAME reference mixture (Supelco 37 Component FAME Mix, CRM47885) at its nominal concentration (202–612 μg/mL; Table S1B), forced through the origin. A separate 40-fold dilution series of the same mixture was used only to characterise linearity and to estimate the limits of detection and quantification (LOD = 3.3σ/S, LOQ = 10σ/S; median LOQ/LOD ratio 3.04). These limits lie at about 4% of the lowest calibration level and are therefore extrapolated; they were not applied to the sample values. In the previous version the units of the calibration range and of the limits were given as ng/mL; the correct unit is μg/mL, since the upper end of every calibration range equals the calibration level of the corresponding component in the processing method (for two components, C15:1 and C24:0, the range reported in the laboratory linearity table ends at 203 and 204 μg/mL whereas the method level is 204 and 404 μg/mL; the method values are shown). The composition of each sample is the calibration-corrected amount of each of the 13 included components divided by their sum, × 100. No internal standard was added, so the result is relative. For three samples the values supplied had already been scaled to a sum of 100, which has no effect on the composition.

### S1.3. Detection and inclusion

A component was recorded as detected when a peak with S/N ≥ 3 was found within its window and as zero otherwise; no quantitation limit was applied to the sample values. Components detected in at least 50% of samples (13 of 37) were included. These 13 components account for a median of 99.9% (interquartile range 99.4–100.0%; minimum 97.0%) of the summed values of all detected panel components other than C18:1n-9 trans. Detection depends on processing as well as on abundance (S1.5).

### S1.4. Identification and correction of the C18:1 artefact

C18:1n-9 trans was reported in 166 of the 177 samples, and both C18:1 components in 164. For each of the latter, the ratio of the reported cis to trans values was computed. In 71, 73 and 74 samples (tolerance ±0.2%, ±0.5% and ±1%) the ratio was constant at 1.1298 (trans to cis 0.8851), identical to at least six significant figures within the ±0.2% cluster over a 73-fold range of values. This constant equals the ratio of the single-level response factors of the two components (557107/493120 = 1.12976) and differs from the ratio of the slopes of the multi-level curves (1.0034), which shows that a single peak was quantified twice against the two single-level calibrations; the processing output for a representative sample showed an identical retention time and integrated area for both components. C18:1n-9 trans was identified by the nearest-retention-time rule, and the cis peak elutes 19.2 s after its expected retention time, which is consistent with this mechanism. The same test applied to all 28 pairs of

panel components eluting within one minute of each other found no other pair in which more than three samples shared a constant ratio within ±0.2%. C18:1n-9 trans was removed from the panel in every sample, and the composition was renormalized over the remaining components; the effect of the correction on every correlation and group comparison is shown in Table S4.

**S1.5. Peak-assignment inconsistency in the C18 region and plausibility criteria**

Samples were classified into three processing subsets: duplication present (n = 71); trans component reported without duplication (n = 95); trans component not reported (n = 11). In the samples with the duplication, stearic acid relative to palmitic acid was about twice its proportion in the pooled quality-control (QC) sample, exceeded oleic acid in 59% of samples and was strongly inversely related to it ($\varrho = -0.74$), and minor components, including C17:0, were detected less often (Table S6E). In 68 of the 95 samples in which the trans component was reported without duplication, stearic acid was not recorded. Adjacent components in the C18 region elute 19–26 s apart (Table S1A), within the 30 s identification window. The laboratory confirmed that this configuration can assign one peak to several components and that a zero for stearic acid indicates that no correct result was computed; in the five QC injections at the start of the sequence the C18 region was assigned correctly, and no relation to injection order was found. The processing subset was not related to glycemic group or to the clinical variables examined (Table S6G).

Profiles were classified as biochemically plausible when (1) palmitic, oleic and linoleic acids were all detected; (2) stearic acid did not exceed oleic acid; and (3) linoleic acid did not exceed 60% of the panel. The criteria were set on biochemical grounds, without reference to the associations. 115 profiles met them (30 / 74 / 11 in C / P / D; 29 of the 71 samples with the duplication and 77 of the 95 without it). Five alternative definitions were examined (Table S6A). Stearic acid is not interpreted in any analysis.

**S1.6. Repeatability and quality control**

A pooled serum QC sample was injected five times at the start of the analytical sequence and thereafter after every ten study samples. Intra-day repeatability from the five initial injections is given in Table S1b for the seven components present at sufficient proportions. The results of the interspersed QC injections could not be retrieved, and repeatability for the remaining six included components was not available; precision across the whole series therefore cannot be reported. Procedural blanks showed no fatty acid peaks above background. All samples were stored at −80 °C without freeze–thaw cycles and analysed in a single campaign with one preparation protocol and one processing method, without manual reintegration.

**Table S1.** Analytical characteristics of the 37 panel components, in order of elution. **A.** Identification.

| No. | Component | Common name | Systematic name (methyl ester analysed) | Expected RT, min | Identification rule | Nearest component (Δ, s) |
|---|---|---|---|---|---|---|
| 1 | C4:0 | Butyric | Butanoic | 5.67 | Highest peak | C6:0 (60.0) |
| 2 | C6:0 | Caproic | Hexanoic | 6.67 | Highest peak | C4:0 (60.0) |
| 3 | C8:0 | Caprylic | Octanoic | 8.54 | Highest peak | C6:0 (112.2) |
| 4 | C10:0 | Capric | Decanoic | 11.37 | Highest peak | C11:0 (99.6) |
| 5 | C11:0 | Undecylic | Undecanoic | 13.03 | Highest peak | C10:0 (99.6) |
| 6 | C12:0 | Lauric | Dodecanoic | 14.79 | Highest peak | C11:0 (105.6) |
| 7 | C13:0 | Tridecylic | Tridecanoic | 16.56 | Highest peak | C12:0 (106.2) |
| 8 | C14:0 | Myristic | Tetradecanoic | 18.34 | Highest peak | C14:1 (58.2) |
| 9 | C14:1 | Myristoleic | cis-9-Tetradecenoic | 19.31 | Highest peak | C15:0 (45.6) |
| 10 | C15:0 | Pentadecylic | Pentadecanoic | 20.07 | Highest peak | C14:1 (45.6) |
| 11 | C15:1 | — | cis-10-Pentadecenoic | 21.06 | Highest peak | C16:0 (47.4) |
| 12 | C16:0 | Palmitic | Hexadecanoic | 21.85 | Highest peak | C16:1 (46.8) |
| 13 | C16:1 | Palmitoleic | cis-9-Hexadecenoic | 22.63 | Highest peak | C16:0 (46.8) |
| 14 | C17:0 | Margaric (heptadecanoic) | Heptadecanoic | 23.63 | Highest peak | C17:1 (51.0) |
| 15 | C17:1 | — | cis-10-Heptadecenoic | 24.48 | Highest peak | C17:0 (51.0) |
| 16 | C18:0 | Stearic | Octadecanoic | 25.52 | Highest peak | C18:1n-9 trans (25.8) |
| 17 | C18:1n-9 trans | Elaidic | trans-9-Octadecenoic | 25.95 | Nearest RT | C18:1n-9 (19.2) |
| 18 | C18:1n-9 | Oleic | cis-9-Octadecenoic | 26.27 | Highest peak | C18:1n-9 trans (19.2) |
| 19 | C18:2n-6 trans | Linolelaidic | trans,trans-9,12-Octadecadienoic | 26.82 | Highest peak | C18:1n-9 (33.0) |
| 20 | C18:2n-6 | Linoleic | cis,cis-9,12-Octadecadienoic | 27.58 | Highest peak | C18:2n-6 trans (45.6) |
| 21 | C20:0 | Arachidic | Eicosanoic | 28.50 | Highest peak | C18:3n-6 (46.8) |
| 22 | C18:3n-6 | γ-Linolenic | cis-6,9,12-Octadecatrienoic | 29.28 | Nearest RT | C18:3n-3 (20.4) |
| 23 | C18:3n-3 | α-Linolenic | cis-9,12,15-Octadecatrienoic | 29.62 | Highest peak | C18:3n-6 (20.4) |
| 24 | C20:1n-9 | Gondoic | cis-11-Eicosenoic | 30.47 | Highest peak | C18:3n-3 (51.0) |
| 25 | C21:0 | Heneicosylic | Heneicosanoic | 31.84 | Nearest RT | C20:2n-6 (10.8) |
| 26 | C20:2n-6 | Eicosadienoic | cis-11,14-Eicosadienoic | 32.02 | Nearest RT | C21:0 (10.8) |
| 27 | C22:0 | Behenic | Docosanoic | 33.05 | Highest peak | C20:3n-6 (43.2) |
| 28 | C20:3n-6 | Dihomo-γ-linolenic (DGLA) | cis-8,11,14-Eicosatrienoic | 33.77 | Nearest RT | C22:1n-9 (9.0) |
| 29 | C22:1n-9 | Erucic | cis-13-Docosenoic | 33.92 | Nearest RT | C20:3n-6 (9.0) |
| 30 | C20:3n-3 | Eicosatrienoic | cis-11,14,17-Eicosatrienoic | 34.21 | Highest peak | C22:1n-9 (17.4) |
| 31 | C23:0 | Tricosylic | Tricosanoic | 35.15 | Highest peak | C20:4n-6 (38.4) |
| 32 | C20:4n-6 | Arachidonic | cis-5,8,11,14-Eicosatetraenoic | 35.79 | Highest peak | C23:0 (38.4) |

| No. | Component | Common name | Systematic name (methyl ester analysed) | Expected RT, min | Identification rule | Nearest component (Δ, s) |
|---|---|---|---|---|---|---|
| 33 | C22:2n-6 | Docosadienoic | cis-13,16-Docosadienoic | 36.57 | Highest peak | C24:0 (15.6) |
| 34 | C24:0 | Lignoceric | Tetracosanoic | 36.83 | Highest peak | C22:2n-6 (15.6) |
| 35 | C20:5n-3 | Eicosapentaenoic (EPA) | cis-5,8,11,14,17-Eicosapentaenoic | 39.03 | Highest peak | C24:1n-9 (60.6) |
| 36 | C24:1n-9 | Nervonic | cis-15-Tetracosenoic | 40.04 | Highest peak | C20:5n-3 (60.6) |
| 37 | C22:6n-3 | Docosahexaenoic (DHA) | cis-4,7,10,13,16,19-Docosahexaenoic | 41.68 | Highest peak | C24:1n-9 (98.4) |

Expected retention time (RT), identification window and identification rule are those of the Xcalibur processing method (TIC trace; ICIS, minimum S/N 3; RT reference). Highest peak, the highest peak within the window is assigned; Nearest RT, the peak nearest to the expected RT is assigned. .

**Table S1 (continued). B.** Calibration and detection.

| No. | Component | Calibration level used for quantification, μg/mL | Linearity range (dilution series), μg/mL | $R^2$ (dilution series) | LOD, μg/mL | LOQ, μg/mL | Detected, % of 177 |
|---|---|---|---|---|---|---|---|
| 1 | C4:0 | 404 | 10.1–404 | 0.9929 | 0.14 | 0.42 | 97.7 |
| 2 | C6:0 | 404 | 10.1–404 | 0.9761 | 0.29 | 0.90 | 60.5 |
| 3 | C8:0 | 404 | 10.1–404 | 0.9968 | 0.10 | 0.38 | 60.5 |
| 4 | C10:0 | 408 | 10.2–408 | 0.9943 | 0.12 | 0.37 | 49.2 |
| 5 | C11:0 | 204 | 5.1–204 | 0.9972 | 0.18 | 0.36 | 0.0 |
| 6 | C12:0 | 404 | 10.1–404 | 0.9715 | 0.28 | 0.85 | 74.0 |
| 7 | C13:0 | 203 | 5–203 | 0.9822 | 0.22 | 0.67 | 0.0 |
| 8 | C14:0 | 404 | 10.1–404 | 0.9844 | 0.20 | 0.62 | 86.4 |
| 9 | C14:1 | 204 | 5.1–204 | 0.9795 | 0.23 | 0.72 | 2.3 |
| 10 | C15:0 | 203 | 5–203 | 0.9855 | 0.20 | 0.61 | 48.0 |
| 11 | C15:1 | 204 | 5–203 | 0.9826 | 0.22 | 0.66 | 0.0 |
| 12 | C16:0 | 612 | 15.3–612 | 0.9604 | 0.37 | 1.13 | 96.6 |
| 13 | C16:1 | 204 | 5.1–204 | 0.9754 | 0.26 | 0.79 | 87.6 |
| 14 | C17:0 | 210 | 5.2–210 | 0.9834 | 0.21 | 0.65 | 72.9 |
| 15 | C17:1 | 204 | 5.1–204 | 0.9771 | 0.25 | 0.76 | 3.4 |
| 16 | C18:0 | 408 | 10.2–408 | 0.9805 | 0.23 | 0.70 | 55.9 |
| 17 | C18:1n-9 trans | 202 | 5–202 | 0.9693 | 0.29 | 0.89 | 93.8 |
| 18 | C18:1n-9 | 404 | 10.1–404 | 0.9804 | 0.23 | 0.70 | 98.9 |
| 19 | C18:2n-6 trans | 202 | 5–202 | 0.9888 | 0.17 | 0.53 | 1.1 |
| 20 | C18:2n-6 | 202 | 5–202 | 0.9718 | 0.28 | 0.85 | 100.0 |
| 21 | C20:0 | 408 | 10.2–408 | 0.9809 | 0.21 | 0.69 | 31.6 |
| 22 | C18:3n-6 | 203 | 5–203 | 0.9745 | 0.27 | 0.80 | 12.4 |
| 23 | C18:3n-3 | 204 | 5.1–204 | 0.9769 | 0.25 | 0.77 | 15.8 |

| No. | Component | Calibration level used for quantification, µg/mL | Linearity range (dilution series), µg/mL | $R^2$ (dilution series) | LOD, µg/mL | LOQ, µg/mL | Detected, % of 177 |
|---|---|---|---|---|---|---|---|
| 24 | C20:1n-9 | 202 | 5–202 | 0.9618 | 0.38 | 1.15 | 0.0 |
| 25 | C21:0 | 203 | 5–203 | 0.9583 | 0.34 | 1.03 | 0.6 |
| 26 | C20:2n-6 | 204 | 5.1–204 | 0.9774 | 0.25 | 0.76 | 0.0 |
| 27 | C22:0 | 405 | 10.1–405 | 0.9797 | 0.23 | 0.71 | 3.4 |
| 28 | C20:3n-6 | 204 | 5.1–204 | 0.9630 | 0.32 | 0.97 | 90.4 |
| 29 | C22:1n-9 | 204 | 5.1–204 | 0.9649 | 0.31 | 0.95 | 0.0 |
| 30 | C20:3n-3 | 204 | 5.1–204 | 0.9846 | 0.21 | 0.62 | 2.8 |
| 31 | C23:0 | 203 | 5–203 | 0.9639 | 0.32 | 0.96 | 33.3 |
| 32 | C20:4n-6 | 202 | 5–202 | 0.9636 | 0.32 | 0.97 | 23.2 |
| 33 | C22:2n-6 | 204 | 5.1–204 | 0.9657 | 0.31 | 0.94 | 2.3 |
| 34 | C24:0 | 404 | 5.1–204 | 0.9924 | 0.14 | 0.43 | 67.2 |
| 35 | C20:5n-3 | 204 | 5.1–204 | 0.9920 | 0.15 | 0.45 | 1.1 |
| 36 | C24:1n-9 | 204 | 5.1–204 | 0.9638 | 0.32 | 0.96 | 1.1 |
| 37 | C22:6n-3 | 203 | 5–203 | 0.9845 | 0.21 | 0.62 | 7.3 |

Sample values were quantified against the single calibration level shown (certified reference mixture CRM47885 at its nominal concentration), with the regression forced through the origin. The dilution series was used only to assess linearity and to estimate the limits of detection (LOD = 3.3σ/S) and quantification (LOQ = 10σ/S), where σ is the standard deviation of the response and S the slope; the limits lie below the lowest calibration level and are extrapolated estimates. They characterise the method on the calibration standards and were not applied to the sample values. Units are µg/mL (given as ng/mL in the previous version in error). Detected, proportion of the 177 samples in which a peak with S/N ≥ 3 was found within the window. Included, detected in at least 50% of samples and entered into the composition and statistical analysis.

**Table S1b.** Intra-day repeatability of serum fatty acid determination in the pooled serum quality-control sample.

| Fatty acid | n | Mean, % of detected profile | SD | CV, % |
|---|---|---|---|---|
| C14:0 (myristic) | 5 | 0.7207 | 0.0381 | 5.29 |
| C16:0 (palmitic) | 5 | 32.0536 | 0.3814 | 1.19 |
| C16:1 (palmitoleic) | 5 | 0.9534 | 0.0340 | 3.57 |
| C17:0 (heptadecanoic) | 5 | 0.2404 | 0.0143 | 5.95 |
| C18:0 (stearic) | 5 | 7.1899 | 0.2329 | 3.24 |
| C18:1n-9 (oleic) | 5 | 16.3978 | 0.9084 | 5.54 |
| C18:2n-6 (linoleic) | 5 | 27.3132 | 0.8112 | 2.97 |

Five aliquots of a pooled serum QC sample, prepared independently, were analysed in five consecutive injections at the start of the analytical sequence on the same day. Repeatability is reported for the seven components present at proportions sufficient for a meaningful coefficient of variation; it was not available for C4:0, C6:0, C8:0, C12:0, C24:0 and C20:3n-6, and the results of the QC injections interspersed through the sequence could not be retrieved. In these injections the C18 region was assigned correctly. SD, standard deviation; CV, coefficient of variation.

**Table S2.** Detection frequency and group comparisons for all 37 panel components (n = 177; 45 / 114 / 18), in order of elution.

| Component | Detected, % | Detected by group, % (C/P/D) | Control | Prediabetes | T2DM | H | p | q |
|---|---|---|---|---|---|---|---|---|
| C4:0 | 97.7 | 100/96/100 | 0.059 [0.050–0.074] | 0.056 [0.045–0.078] | 0.045 [0.035–0.061] | 4.14 | 0.126 | 0.391 |
| C6:0 | 60.5 | 69/57/61 | 0.076 [0.000–0.296] | 0.005 [0.000–0.121] | 0.021 [0.000–0.239] | 4.29 | 0.117 | 0.391 |
| C8:0 | 60.5 | 71/57/56 | 0.008 [0.000–0.012] | 0.002 [0.000–0.008] | 0.001 [0.000–0.005] | 7.13 | 0.0284 | 0.180 |
| C10:0 | 49.2 | 62/45/44 | 0.011 [0.000–0.023] | 0.000 [0.000–0.012] | 0.000 [0.000–0.011] | 6.81 | 0.0333 | 0.180 |
| C11:0 | 0.0 | 0/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | — | — | — |
| C12:0 | 74.0 | 84/70/72 | 0.010 [0.003–0.015] | 0.006 [0.000–0.012] | 0.005 [0.000–0.009] | 6.72 | 0.0348 | 0.180 |
| C13:0 | 0.0 | 0/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | — | — | — |
| C14:0 | 86.4 | 96/82/89 | 0.726 [0.496–0.984] | 0.742 [0.229–0.985] | 0.562 [0.384–1.015] | 0.98 | 0.611 | 0.839 |
| C14:1 | 2.3 | 2/3/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.48 | 0.785 | 0.856 |
| C15:0 | 48.0 | 56/47/33 | 0.035 [0.000–0.103] | 0.000 [0.000–0.084] | 0.000 [0.000–0.049] | 3.16 | 0.206 | 0.531 |
| C15:1 | 0.0 | 0/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | — | — | — |
| C16:0 | 96.6 | 96/96/100 | 30.017 [26.725–33.458] | 29.675 [26.999–32.537] | 32.201 [30.560–35.189] | 7.00 | 0.0302 | 0.180 |
| C16:1 | 87.6 | 96/84/89 | 0.748 [0.408–1.330] | 0.938 [0.353–1.522] | 0.948 [0.159–1.693] | 0.47 | 0.789 | 0.856 |
| C17:0 | 72.9 | 89/70/50 | 0.229 [0.044–0.308] | 0.163 [0.000–0.286] | 0.011 [0.000–0.169] | 7.33 | 0.0256 | 0.180 |
| C17:1 | 3.4 | 2/4/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 1.20 | 0.55 | 0.839 |
| C18:0 | 55.9 | 47/61/50 | 0.000 [0.000–12.985] | 11.465 [0.000–14.071] | 6.368 [0.000–16.560] | 1.76 | 0.415 | 0.804 |
| C18:1n-9 trans | 93.8 | 93/95/89 | 0.558 [0.296–8.886] | 0.921 [0.221–10.694] | 0.615 [0.305–8.760] | 0.44 | 0.801 | 0.856 |
| C18:1n-9 | 98.9 | 100/98/100 | 13.811 [11.725–15.175] | 13.774 [11.586–16.144] | 13.958 [10.368–17.218] | 0.18 | 0.913 | 0.944 |
| C18:2n-6 trans | 1.1 | 2/1/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.76 | 0.684 | 0.848 |
| C18:2n-6 | 100.0 | 100/100/100 | 30.985 [26.560–34.823] | 28.335 [24.553–32.959] | 28.373 [23.693–30.305] | 4.94 | 0.0845 | 0.328 |
| C20:0 | 31.6 | 38/29/33 | 0.000 [0.000–0.049] | 0.000 [0.000–0.028] | 0.000 [0.000–0.113] | 1.05 | 0.593 | 0.839 |
| C18:3n-6 | 12.4 | 11/14/6 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 1.21 | 0.547 | 0.839 |
| C18:3n-3 | 15.8 | 16/16/17 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.00 | 0.998 | 0.998 |
| C20:1n-9 | 0.0 | 0/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | — | — | — |
| C21:0 | 0.6 | 2/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 2.93 | 0.231 | 0.550 |
| C20:2n-6 | 0.0 | 0/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | — | — | — |
| C22:0 | 3.4 | 7/3/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 2.28 | 0.32 | 0.695 |
| C20:3n-6 | 90.4 | 98/88/89 | 2.690 [1.800–4.111] | 2.564 [1.297–3.514] | 2.575 [0.970–4.162] | 2.18 | 0.336 | 0.695 |
| C22:1n-9 | 0.0 | 0/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | — | — | — |
| C20:3n-3 | 2.8 | 4/3/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.95 | 0.622 | 0.839 |
| C23:0 | 33.3 | 49/25/44 | 0.000 [0.000–0.482] | 0.000 [0.000–0.003] | 0.000 [0.000–0.351] | 7.99 | 0.0184 | 0.180 |
| C20:4n-6 | 23.2 | 33/20/17 | 0.000 [0.000–0.004] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 3.35 | 0.187 | 0.527 |

| Component | Detected, % | Detected by group, % (C/P/D) | Control | Prediabetes | T2DM | H | p | q |
|---|---|---|---|---|---|---|---|---|
| C22:2n-6 | 2.3 | 2/3/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.49 | 0.784 | 0.856 |
| C24:0 | 67.2 | 73/66/61 | 0.141 [0.000–0.258] | 0.088 [0.000–0.252] | 0.039 [0.000–0.236] | 1.47 | 0.48 | 0.839 |
| C20:5n-3 | 1.1 | 0/2/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 1.11 | 0.574 | 0.839 |
| C24:1n-9 | 1.1 | 4/0/0 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 5.90 | 0.0523 | 0.232 |
| C22:6n-3 | 7.3 | 9/6/11 | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.000 [0.000–0.000] | 0.81 | 0.668 | 0.848 |

Values are median [interquartile range] of the values as supplied by the laboratory (calibration-corrected values of all 37 components; median sum 91.9 [89.0–94.7]), so they differ from the percentages of the quantified profile in Table 2 of the main text. Detected, proportion of samples with a peak of S/N ≥ 3 within the identification window. Groups were compared by the Kruskal–Wallis test (H, statistic); q, Benjamini–Hochberg adjusted p across the 31 components for which the test could be computed; —, not computable because the component was not detected in any sample. These comparisons are descriptive: the inferential analysis is confined to the 13 included components (Tables 2 and 3 of the main text). Values for C18:0 are not interpretable (Note S1.5). * C18:1n-9 trans excluded as a peak-assignment artefact. Shorthand notation: Cx:y, x carbon atoms and y double bonds; n-z, position of the first double bond from the methyl end. Common and systematic names of all components are given in Table S1A.

**Table S3.** Partial Spearman correlations between the 13 fatty acids and glycemic and cardiometabolic parameters, adjusted for age, sex, body mass index and waist circumference, r (q). **A.** All participants with covariates (controls and prediabetes).

| Fatty acid | HbA1c (n = 107) | Fasting glucose (n = 107) | Triglycerides (n = 107) | HDL-C (n = 107) | LDL-C (n = 107) |
|---|---|---|---|---|---|
| C4:0 | +0.075 (0.751) | +0.184 (0.374) | −0.313 (0.007) | −0.108 (0.437) | −0.178 (0.218) |
| C6:0 | −0.083 (0.751) | −0.054 (0.814) | −0.103 (0.418) | +0.161 (0.253) | +0.137 (0.257) |
| C8:0 | −0.171 (0.592) | −0.147 (0.427) | −0.077 (0.509) | +0.081 (0.529) | +0.103 (0.379) |
| C12:0 | −0.158 (0.592) | −0.167 (0.374) | −0.175 (0.155) | +0.189 (0.224) | +0.024 (0.808) |
| C14:0 | −0.145 (0.592) | +0.038 (0.814) | +0.163 (0.174) | +0.007 (0.940) | +0.057 (0.607) |
| C16:0 | −0.036 (0.827) | −0.076 (0.814) | −0.260 (0.022) | −0.014 (0.940) | −0.240 (0.056) |
| C16:1 | −0.045 (0.827) | +0.072 (0.814) | +0.247 (0.027) | +0.135 (0.361) | +0.092 (0.409) |
| C17:0 | −0.100 (0.751) | +0.023 (0.814) | +0.028 (0.776) | +0.087 (0.529) | +0.129 (0.268) |
| C18:0 † | +0.069 (0.751) | +0.028 (0.814) | −0.274 (0.018) | +0.044 (0.769) | −0.261 (0.043) |
| C18:1n-9 | +0.008 (0.936) | +0.177 (0.374) | +0.612 (<0.001) | −0.242 (0.157) | +0.141 (0.257) |
| C18:2n-6 | +0.029 (0.827) | −0.127 (0.500) | +0.082 (0.509) | +0.119 (0.412) | +0.389 (<0.001) |
| C20:3n-6 | −0.105 (0.751) | −0.056 (0.814) | +0.070 (0.512) | +0.161 (0.253) | +0.147 (0.257) |
| C24:0 | −0.063 (0.751) | −0.041 (0.814) | +0.132 (0.285) | +0.191 (0.224) | +0.156 (0.257) |

**Table S3 (continued). B.** Biochemically plausible profiles with covariates.

| Fatty acid | HbA1c (n = 71) | Fasting glucose (n = 71) | Triglycerides (n = 71) | HDL-C (n = 71) | LDL-C (n = 71) |
|---|---|---|---|---|---|
| C4:0 | +0.144 (0.729) | +0.168 (0.412) | −0.280 (0.039) | −0.097 (0.498) | −0.181 (0.424) |
| C6:0 | −0.013 (0.915) | −0.056 (0.903) | −0.315 (0.026) | +0.165 (0.345) | +0.002 (0.987) |
| C8:0 | −0.155 (0.729) | −0.157 (0.412) | −0.229 (0.089) | +0.099 (0.498) | −0.063 (0.795) |
| C12:0 | −0.109 (0.729) | −0.158 (0.412) | −0.272 (0.041) | +0.151 (0.345) | −0.094 (0.795) |
| C14:0 | −0.182 (0.729) | −0.015 (0.927) | +0.062 (0.717) | +0.037 (0.760) | −0.201 (0.405) |
| C16:0 | −0.081 (0.729) | −0.030 (0.927) | −0.331 (0.026) | +0.079 (0.557) | −0.220 (0.405) |
| C16:1 | −0.076 (0.729) | +0.011 (0.927) | +0.290 (0.037) | +0.127 (0.423) | −0.054 (0.795) |
| C17:0 | −0.097 (0.729) | −0.047 (0.903) | −0.091 (0.652) | +0.150 (0.345) | −0.051 (0.795) |
| C18:0 † | +0.143 (0.729) | +0.127 (0.474) | +0.078 (0.670) | −0.171 (0.345) | −0.054 (0.795) |
| C18:1n-9 | +0.059 (0.739) | +0.158 (0.412) | +0.735 (<0.001) | −0.357 (0.029) | −0.072 (0.795) |
| C18:2n-6 | −0.013 (0.915) | −0.300 (0.142) | −0.313 (0.026) | +0.307 (0.060) | +0.347 (0.039) |
| C20:3n-6 | −0.070 (0.729) | −0.158 (0.412) | −0.034 (0.777) | +0.238 (0.198) | −0.073 (0.795) |
| C24:0 | −0.115 (0.729) | −0.129 (0.474) | +0.052 (0.722) | +0.204 (0.288) | +0.017 (0.964) |

Partial correlation computed as the Spearman correlation between the residuals of the fatty acid proportion and of the clinical parameter after linear regression on age, sex, BMI and waist circumference. q, Benjamini–Hochberg adjusted p within each clinical parameter across the 13 fatty acids; exact p-values are in Table S7. BMI is not shown as an outcome because it is one of the covariates. No participant with T2DM is included. † Not interpretable (Note S1.5). Shorthand notation: Cx:y, x carbon atoms and y double bonds; n-z, position of the first double bond from the methyl end. Common and systematic names of all components are given in Table S1A.

**Table S4.** Effect of the C18:1 correction. **A.** Spearman correlations before (14 components including C18:1n-9 trans) and after (13 components) the correction.

| Clinical parameter | Fatty acid | ϱ before | q before | ϱ after | q after | n |
|---|---|---|---|---|---|---|
| HbA1c | C4:0 | −0.066 | 0.483 | −0.062 | 0.485 | 177 |
| HbA1c | C6:0 | −0.103 | 0.339 | −0.102 | 0.293 | 177 |
| HbA1c | C8:0 | −0.183 | 0.071 | −0.183 | 0.063 | 177 |
| HbA1c | C12:0 | −0.144 | 0.198 | −0.146 | 0.138 | 177 |
| HbA1c | C14:0 | −0.081 | 0.393 | −0.092 | 0.293 | 177 |
| HbA1c | C16:0 | +0.105 | 0.339 | +0.174 | 0.066 | 177 |
| HbA1c | C16:1 | +0.031 | 0.740 | +0.034 | 0.656 | 177 |
| HbA1c | C17:0 | −0.221 | 0.045 | −0.218 | 0.033 | 177 |
| HbA1c | C18:0 † | +0.088 | 0.379 | +0.095 | 0.293 | 177 |
| HbA1c | C18:1n-9 | +0.019 | 0.801 | +0.041 | 0.635 | 177 |

| Clinical parameter | Fatty acid | ϱ before | q before | ϱ after | q after | n |
|---|---|---|---|---|---|---|
| HbA1c | C18:2n-6 | −0.182 | 0.071 | −0.210 | 0.033 | 177 |
| HbA1c | C20:3n-6 | −0.117 | 0.336 | −0.111 | 0.293 | 177 |
| HbA1c | C24:0 | −0.098 | 0.339 | −0.098 | 0.293 | 177 |
| Fasting glucose | C4:0 | −0.038 | 0.770 | −0.049 | 0.596 | 177 |
| Fasting glucose | C6:0 | −0.021 | 0.781 | −0.024 | 0.755 | 177 |
| Fasting glucose | C8:0 | −0.115 | 0.338 | −0.122 | 0.230 | 177 |
| Fasting glucose | C12:0 | −0.130 | 0.300 | −0.141 | 0.230 | 177 |
| Fasting glucose | C14:0 | +0.054 | 0.666 | +0.045 | 0.596 | 177 |
| Fasting glucose | C16:0 | +0.155 | 0.277 | +0.184 | 0.093 | 177 |
| Fasting glucose | C16:1 | +0.084 | 0.466 | +0.080 | 0.455 | 177 |
| Fasting glucose | C17:0 | −0.110 | 0.338 | −0.117 | 0.230 | 177 |
| Fasting glucose | C18:0 † | −0.129 | 0.300 | −0.121 | 0.230 | 177 |
| Fasting glucose | C18:1n-9 | +0.186 | 0.185 | +0.209 | 0.069 | 177 |
| Fasting glucose | C18:2n-6 | −0.030 | 0.770 | −0.076 | 0.455 | 177 |
| Fasting glucose | C20:3n-6 | −0.104 | 0.338 | −0.116 | 0.230 | 177 |
| Fasting glucose | C24:0 | −0.066 | 0.598 | −0.068 | 0.476 | 177 |
| BMI | C4:0 | −0.040 | 0.721 | −0.022 | 0.822 | 107 |
| BMI | C6:0 | −0.071 | 0.721 | −0.072 | 0.679 | 107 |
| BMI | C8:0 | −0.142 | 0.337 | −0.146 | 0.348 | 107 |
| BMI | C12:0 | −0.066 | 0.721 | −0.071 | 0.679 | 107 |
| BMI | C14:0 | −0.056 | 0.721 | −0.057 | 0.731 | 107 |
| BMI | C16:0 | +0.035 | 0.721 | +0.080 | 0.679 | 107 |
| BMI | C16:1 | +0.146 | 0.337 | +0.155 | 0.348 | 107 |
| BMI | C17:0 | −0.146 | 0.337 | −0.152 | 0.348 | 107 |
| BMI | C18:0 † | −0.045 | 0.721 | −0.030 | 0.818 | 107 |
| BMI | C18:1n-9 | +0.242 | 0.167 | +0.291 | 0.030 | 107 |
| BMI | C18:2n-6 | −0.093 | 0.682 | −0.091 | 0.679 | 107 |
| BMI | C20:3n-6 | −0.183 | 0.337 | −0.186 | 0.348 | 107 |
| BMI | C24:0 | −0.042 | 0.721 | −0.040 | 0.802 | 107 |
| Triglycerides | C4:0 | −0.289 | 0.011 | −0.287 | 0.011 | 109 |
| Triglycerides | C6:0 | −0.127 | 0.329 | −0.126 | 0.278 | 109 |
| Triglycerides | C8:0 | −0.103 | 0.401 | −0.104 | 0.364 | 109 |
| Triglycerides | C12:0 | −0.167 | 0.194 | −0.169 | 0.147 | 109 |
| Triglycerides | C14:0 | +0.179 | 0.176 | +0.192 | 0.120 | 109 |
| Triglycerides | C16:0 | −0.131 | 0.329 | −0.177 | 0.141 | 109 |
| Triglycerides | C16:1 | +0.301 | 0.010 | +0.319 | 0.005 | 109 |
| Triglycerides | C17:0 | +0.039 | 0.773 | +0.040 | 0.800 | 109 |
| Triglycerides | C18:0 † | −0.242 | 0.040 | −0.236 | 0.044 | 109 |
| Triglycerides | C18:1n-9 | +0.590 | <0.001 | +0.647 | <0.001 | 109 |
| Triglycerides | C18:2n-6 | +0.035 | 0.773 | +0.000 | 1.000 | 109 |
| Triglycerides | C20:3n-6 | +0.005 | 0.958 | +0.008 | 1.000 | 109 |
| Triglycerides | C24:0 | +0.118 | 0.343 | +0.128 | 0.278 | 109 |
| HDL-C | C4:0 | −0.056 | 0.720 | −0.078 | 0.621 | 109 |
| HDL-C | C6:0 | +0.159 | 0.244 | +0.160 | 0.235 | 109 |
| HDL-C | C8:0 | +0.069 | 0.667 | +0.069 | 0.621 | 109 |
| HDL-C | C12:0 | +0.156 | 0.244 | +0.155 | 0.235 | 109 |
| HDL-C | C14:0 | +0.014 | 0.951 | +0.010 | 0.915 | 109 |
| HDL-C | C16:0 | +0.022 | 0.951 | −0.026 | 0.915 | 109 |
| HDL-C | C16:1 | +0.092 | 0.596 | +0.080 | 0.621 | 109 |
| HDL-C | C17:0 | +0.076 | 0.667 | +0.076 | 0.621 | 109 |
| HDL-C | C18:0 † | −0.002 | 0.986 | −0.013 | 0.915 | 109 |
| HDL-C | C18:1n-9 | −0.183 | 0.244 | −0.258 | 0.088 | 109 |
| HDL-C | C18:2n-6 | +0.173 | 0.244 | +0.164 | 0.235 | 109 |

| Clinical parameter | Fatty acid | ϱ before | q before | ϱ after | q after | n |
|---|---|---|---|---|---|---|
| HDL-C | C20:3n-6 | +0.209 | 0.244 | +0.205 | 0.210 | 109 |
| HDL-C | C24:0 | +0.167 | 0.244 | +0.164 | 0.235 | 109 |
| LDL-C | C4:0 | −0.195 | 0.147 | −0.212 | 0.071 | 109 |
| LDL-C | C6:0 | +0.109 | 0.364 | +0.112 | 0.321 | 109 |
| LDL-C | C8:0 | +0.073 | 0.485 | +0.073 | 0.485 | 109 |
| LDL-C | C12:0 | +0.038 | 0.697 | +0.029 | 0.764 | 109 |
| LDL-C | C14:0 | +0.092 | 0.436 | +0.101 | 0.348 | 109 |
| LDL-C | C16:0 | −0.128 | 0.285 | −0.223 | 0.071 | 109 |
| LDL-C | C16:1 | +0.152 | 0.226 | +0.162 | 0.154 | 109 |
| LDL-C | C17:0 | +0.146 | 0.226 | +0.150 | 0.174 | 109 |
| LDL-C | C18:0 † | −0.264 | 0.039 | −0.279 | 0.021 | 109 |
| LDL-C | C18:1n-9 | +0.250 | 0.041 | +0.215 | 0.071 | 109 |
| LDL-C | C18:2n-6 | +0.314 | 0.012 | +0.335 | 0.005 | 109 |
| LDL-C | C20:3n-6 | +0.153 | 0.226 | +0.161 | 0.154 | 109 |
| LDL-C | C24:0 | +0.174 | 0.199 | +0.179 | 0.136 | 109 |

Before, composition renormalized over the 14 components detected in at least 50% of samples, including C18:1n-9 trans; after, over the 13 components used in the main text. q, Benjamini–Hochberg adjusted p within each clinical parameter across the fatty acids of the respective panel (14 before, 13 after; the q-values therefore also reflect the change in the size of the family). Of the 78 correlations, $|\varrho|$ increased by more than 0.001 in 48, decreased by more than 0.001 in 23 and changed by no more than 0.001 in 7. Three associations changed status at $q < 0.05$: C18:2n-6 × HbA1c ($\varrho = -0.182$, $q = 0.071$ before; $\varrho = -0.210$, $q = 0.033$ after); C18:1n-9 × BMI ($\varrho = 0.242$, $q = 0.167$ before; $\varrho = 0.291$, $q = 0.030$ after); C18:1n-9 × LDL-C ($\varrho = 0.250$, $q = 0.041$ before; $\varrho = 0.215$, $q = 0.071$ after). † Not interpretable.

**Table S4 (continued). B.** Kruskal–Wallis comparisons between glycemic groups before and after the correction (n = 45 / 114 / 18).

| Fatty acid | H before | p before | q before | H after | p after | q after |
|---|---|---|---|---|---|---|
| C4:0 | 4.26 | 0.119 | 0.243 | 5.01 | 0.0815 | 0.177 |
| C6:0 | 4.32 | 0.115 | 0.243 | 4.31 | 0.116 | 0.216 |
| C8:0 | 7.25 | 0.0267 | 0.168 | 7.36 | 0.0253 | 0.100 |
| C12:0 | 6.64 | 0.0361 | 0.168 | 6.93 | 0.0313 | 0.100 |
| C14:0 | 1.03 | 0.599 | 0.762 | 1.11 | 0.575 | 0.680 |
| C16:0 | 4.22 | 0.121 | 0.243 | 6.51 | 0.0385 | 0.100 |
| C16:1 | 0.42 | 0.811 | 0.873 | 0.51 | 0.775 | 0.781 |
| C17:0 | 7.67 | 0.0216 | 0.168 | 7.64 | 0.0219 | 0.100 |
| C18:0 † | 1.62 | 0.445 | 0.644 | 1.94 | 0.379 | 0.547 |
| C18:1n-9 | 0.04 | 0.98 | 0.980 | 0.49 | 0.781 | 0.781 |
| C18:2n-6 | 5.81 | 0.0547 | 0.192 | 7.94 | 0.0189 | 0.100 |
| C20:3n-6 | 2.28 | 0.32 | 0.560 | 2.17 | 0.339 | 0.547 |
| C24:0 | 1.55 | 0.46 | 0.644 | 1.57 | 0.457 | 0.594 |
| C18:1n-9 trans (excluded) | 0.46 | 0.794 | 0.873 | — | — | — |

q, Benjamini–Hochberg adjusted p across the components of the respective panel. † Not interpretable.

**Table S5.** Availability of clinical variables by glycemic group, n recorded / n in group.

| Variable | Control | Prediabetes | T2DM | Total |
|---|---|---|---|---|
| Fasting plasma glucose | 45/45 | 114/114 | 18/18 | 177/177 |
| HbA1c | 45/45 | 114/114 | 18/18 | 177/177 |
| Age | 24/45 | 85/114 | 0/18 | 109/177 |
| Sex | 24/45 | 85/114 | 0/18 | 109/177 |
| Body mass index | 24/45 | 83/114 | 0/18 | 107/177 |
| Waist circumference | 24/45 | 83/114 | 0/18 | 107/177 |
| Systolic blood pressure | 24/45 | 83/114 | 0/18 | 107/177 |
| Diastolic blood pressure | 24/45 | 83/114 | 0/18 | 107/177 |
| Total cholesterol | 24/45 | 85/114 | 0/18 | 109/177 |
| HDL cholesterol | 24/45 | 85/114 | 0/18 | 109/177 |

| Variable | Control | Prediabetes | T2DM | Total |
|---|---|---|---|---|
| LDL cholesterol | 24/45 | 85/114 | 0/18 | 109/177 |
| Triglycerides | 24/45 | 85/114 | 0/18 | 109/177 |
| Creatinine | 24/45 | 85/114 | 0/18 | 109/177 |
| Smoking status | 24/45 | 83/114 | 0/18 | 107/177 |
| Antihypertensive medication | 24/45 | 83/114 | 0/18 | 107/177 |

Variables not recorded in the clinical dataset are shown as missing; the reasons were not documented (Section 4.1 of the main text). HbA1c was recorded to the nearest whole percentage point for 117 of the 177 participants (23/45 / 83/114 / 11/18 in C / P / D), including 105 of the 109 with a complete clinical profile. Median FPG in participants with versus without a complete clinical profile: controls 4.96 versus 3.85 mmol/L; prediabetes 5.28 versus 3.99 mmol/L; T2DM, no participant with a complete profile (median 7.43 mmol/L).

**Table S6.** Sensitivity analyses for the principal associations. **A.** Processing subsets and plausibility definitions: Spearman ϱ (q; n).

| Subset | C18:1n-9 × triglycerides | C16:1 × triglycerides | C18:2n-6 × HbA1c | C18:2n-6 × LDL-C | C17:0 × HbA1c |
|---|---|---|---|---|---|
| Full sample | +0.647 (<0.001; 109) | +0.319 (0.005; 109) | −0.210 (0.033; 177) | +0.335 (0.005; 109) | −0.218 (0.033; 177) |
| Plausible profiles (main definition) | +0.742 (<0.001; 72) | +0.332 (0.014; 72) | −0.272 (0.042; 115) | +0.283 (0.206; 72) | −0.161 (0.416; 115) |
| Affected samples (C18:1 duplication) | +0.685 (<0.001; 41) | +0.333 (0.108; 41) | −0.247 (0.164; 71) | +0.342 (0.125; 41) | −0.324 (0.075; 71) |
| Affected samples, plausible | +0.649 (0.046; 18) | +0.241 (0.785; 18) | −0.387 (0.494; 29) | +0.620 (0.039; 18) | −0.151 (0.896; 29) |
| Unaffected samples | +0.625 (<0.001; 60) | +0.336 (0.029; 60) | −0.251 (0.185; 95) | +0.188 (0.944; 60) | −0.113 (0.714; 95) |
| Unaffected samples, plausible | +0.784 (<0.001; 48) | +0.449 (0.006; 48) | −0.325 (0.051; 77) | +0.114 (0.985; 48) | −0.145 (0.676; 77) |
| Alternative: stearic ≤ 0.8 × oleic | +0.796 (<0.001; 55) | +0.369 (0.010; 55) | −0.262 (0.201; 85) | +0.284 (0.115; 55) | −0.141 (0.491; 85) |
| Alternative: stearic ≤ 1.2 × oleic | +0.726 (<0.001; 85) | +0.319 (0.019; 85) | −0.250 (0.050; 132) | +0.341 (0.018; 85) | −0.138 (0.376; 132) |
| Alternative: main definition and ≥ 8 components detected | +0.765 (<0.001; 67) | +0.442 (0.001; 67) | −0.277 (0.044; 110) | +0.226 (0.856; 67) | −0.130 (0.459; 110) |
| Alternative: stearic ≤ oleic only | +0.580 (<0.001; 76) | +0.229 (0.076; 76) | −0.267 (0.038; 122) | +0.313 (0.078; 76) | −0.195 (0.204; 122) |
| Alternative: plausible, affected samples excluded | +0.749 (<0.001; 54) | +0.417 (0.007; 54) | −0.272 (0.146; 86) | +0.223 (0.618; 54) | −0.163 (0.462; 86) |

Spearman correlations with q (Benjamini–Hochberg within the clinical parameter across the 13 fatty acids, recomputed in each subset) and n. Affected samples, C18:1 duplication present (n = 71); unaffected samples, trans component reported without duplication (n = 95); plausible, main definition in Note S1.5. Alternative definitions: criteria (1) and (3) with stearic acid not exceeding 0.8 or 1.2 times oleic acid; the main definition with at least 8 of 37 components detected; criterion (2) alone; and the main definition with the affected samples excluded. Triglyceride and LDL-C analyses include controls and prediabetes only.

**Table S6 (continued). B.** Inclusion threshold and exclusion of C4:0: Spearman ϱ (q; n).

| Inclusion threshold (panel size) | C18:1n-9 × triglycerides | C16:1 × triglycerides | C18:2n-6 × HbA1c | C18:2n-6 × LDL-C | C17:0 × HbA1c |
|---|---|---|---|---|---|
| 25% (17 components) | +0.647 (<0.001; 109) | +0.319 (0.006; 109) | −0.211 (0.041; 177) | +0.330 (0.008; 109) | −0.218 (0.041; 177) |
| 33% (16 components) | +0.648 (<0.001; 109) | +0.319 (0.006; 109) | −0.210 (0.041; 177) | +0.333 (0.007; 109) | −0.217 (0.041; 177) |
| 40% (15 components) | +0.646 (<0.001; 109) | +0.318 (0.006; 109) | −0.211 (0.037; 177) | +0.335 (0.005; 109) | −0.218 (0.037; 177) |
| 50% (13 components) | +0.647 (<0.001; 109) | +0.319 (0.005; 109) | −0.210 (0.033; 177) | +0.335 (0.005; 109) | −0.218 (0.033; 177) |
| 60% (12 components) | +0.646 (<0.001; 109) | +0.324 (0.003; 109) | −0.244 (0.013; 177) | +0.270 (0.027; 109) | −0.224 (0.016; 177) |
| 70% (9 components) | +0.648 (<0.001; 109) | +0.323 (0.002; 109) | −0.246 (0.009; 177) | +0.278 (0.016; 109) | −0.225 (0.011; 177) |
| C4:0 excluded (12 components) | +0.646 (<0.001; 109) | +0.319 (0.004; 109) | −0.210 (0.030; 177) | +0.335 (0.004; 109) | −0.219 (0.030; 177) |

The composition was renormalized over the components detected in at least the stated proportion of samples (C18:1n-9 trans always excluded); 50% is the main analysis. q within the clinical parameter across the components of each panel.

**Table S6 (continued). C.** Data subsets: correlation with HbA1c, ϱ (p; n).

| Fatty acid | All, data subset as covariate (partial) | Complete clinical profile | FPG and HbA1c only | FPG and HbA1c only, without T2DM |
|---|---|---|---|---|
| C17:0 | −0.240 (p = 0.00129; 177) | −0.168 (p = 0.0814; 109) | −0.352 (p = 0.00322; 68) | −0.123 (p = 0.395; 50) |
| C18:2n-6 | −0.175 (p = 0.0199; 177) | −0.094 (p = 0.33; 109) | −0.359 (p = 0.00267; 68) | −0.350 (p = 0.0126; 50) |

Partial correlation computed as in Table S3, with the data-subset indicator as the only covariate. In the complete-profile subset HbA1c is effectively binary (Table S5); in the subset with FPG and HbA1c only, HbA1c was recorded to two decimal places for 49 of the 50 participants without T2DM.

**Table S6 (continued). D.** Compositional approaches: Spearman ϱ (p; n).

| Subset | Association | Percentage of quantified profile | clr, 13 components | clr, subcomposition (detected in ≥85%) | ALR to C16:0 |
|---|---|---|---|---|---|
| Full sample | C18:1n-9 × Triglycerides | +0.647 (p = $3.0 \times 10^{-14}$; 109) | +0.117 (p = 0.226; 109) | +0.110 (p = 0.255; 109) | +0.735 (p = $4.1 \times 10^{-19}$; 105) |
| Full sample | C16:1 × Triglycerides | +0.319 (p = $7.3 \times 10^{-4}$; 109) | +0.388 (p = $3.0 \times 10^{-5}$; 109) | +0.371 (p = $7.2 \times 10^{-5}$; 109) | +0.455 (p = $6.7 \times 10^{-6}$; 90) |
| Full sample | C18:2n-6 × HbA1c | −0.210 (p = 0.00506; 177) | +0.102 (p = 0.178; 177) | +0.003 (p = 0.97; 177) | −0.267 (p = $4.1 \times 10^{-4}$; 171) |
| Full sample | C18:2n-6 × LDL-C | +0.335 (p = $3.7 \times 10^{-4}$; 109) | −0.046 (p = 0.635; 109) | −0.039 (p = 0.685; 109) | +0.356 (p = $1.8 \times 10^{-4}$; 106) |
| Full sample | C17:0 × HbA1c | −0.218 (p = 0.00353; 177) | −0.192 (p = 0.0106; 177) | n.a. | −0.026 (p = 0.775; 124) |
| Plausible profiles | C18:1n-9 × Triglycerides | +0.742 (p = $9.2 \times 10^{-14}$; 72) | +0.309 (p = 0.00823; 72) | +0.344 (p = 0.00308; 72) | +0.728 (p = $4.3 \times 10^{-13}$; 72) |
| Plausible profiles | C16:1 × Triglycerides | +0.332 (p = 0.0044; 72) | +0.400 (p = $5.0 \times 10^{-4}$; 72) | +0.402 (p = $4.6 \times 10^{-4}$; 72) | +0.503 (p = $1.3 \times 10^{-5}$; 68) |
| Plausible profiles | C18:2n-6 × HbA1c | −0.272 (p = 0.00322; 115) | −0.006 (p = 0.946; 115) | −0.155 (p = 0.0978; 115) | −0.321 (p = $4.8 \times 10^{-4}$; 115) |
| Plausible profiles | C18:2n-6 × LDL-C | +0.283 (p = 0.0159; 72) | +0.068 (p = 0.572; 72) | +0.097 (p = 0.417; 72) | +0.326 (p = 0.00518; 72) |
| Plausible profiles | C17:0 × HbA1c | −0.161 (p = 0.0863; 115) | −0.140 (p = 0.136; 115) | n.a. | −0.084 (p = 0.406; 99) |

clr, centred log-ratio after multiplicative replacement of zeros at 65% of the smallest detected value of each component; subcomposition: C4:0, C14:0, C16:0, C16:1, C18:1n-9, C18:2n-6, C20:3n-6 (C17:0 is not part of it, n.a.); ALR, additive log-ratio to palmitic acid, computed where both components were detected. For C17:0 × HbA1c under clr transformation of the 13 components, q = 0.120 (replacement by half the smallest detected value), 0.134 (65% of it) and 0.138 (multiplicative replacement).

**Table S6 (continued). E.** Heptadecanoic acid (C17:0): detection, censored and logistic models, coherence, bootstrap and power.

| Analysis | Subset | Result (n) |
|---|---|---|
| Not detected, n/N (%) | Full sample | 48/177 (27%) |
| Detected, % (control / prediabetes / T2DM) | Full sample | 89 / 70 / 50 |
| Detected, % | Affected samples | 51 (36/71) |
| Detected, % | Unaffected samples | 91 (86/95) |
| Detected, % | Plausible profiles | 86 (99/115) |
| C17:0/C16:0 among detected, % of QC sample, median [IQR] | Affected samples | 76 [30–125] (36) |
| C17:0/C16:0 among detected, % of QC sample, median [IQR] | Unaffected samples | 114 [74–139] (81) |
| Spearman ϱ with HbA1c among detected samples | Full sample | −0.020 (p = 0.819; 129) |
| Spearman ϱ with HbA1c among detected samples | Plausible profiles | −0.048 (p = 0.634; 99) |
| Spearman ϱ of log(C17:0/C16:0) with HbA1c | Full sample | −0.026 (p = 0.775; 124) |
| Tobit regression of log C17:0, per 1 SD of HbA1c | Full sample | β = −0.437 [−0.761; −0.112], p = 0.00835 (177; 48 censored) |
| Tobit regression of log C17:0, per 1 SD of HbA1c | Affected samples | β = −0.871 [−1.599; −0.143], p = 0.019 (71; 35 censored) |
| Tobit regression of log C17:0, per 1 SD of HbA1c | Unaffected samples | β = −0.028 [−0.297; +0.242], p = 0.841 (95; 9 censored) |
| Tobit regression of log C17:0, per 1 SD of HbA1c | Plausible profiles | β = −0.209 [−0.512; +0.093], p = 0.175 (115; 16 censored) |
| Tobit regression of log C17:0, per 1 SD of HbA1c | Plausible, unaffected | β = −0.030 [−0.303; +0.243], p = 0.831 (77; 5 censored) |

| Analysis | Subset | Result (n) |
|---|---|---|
| Logistic regression of detection, per 1% HbA1c | Full sample | OR = 0.59 [0.40; 0.88], p = 0.0105 (177) |
| Logistic regression of detection, per 1% HbA1c | Full sample, adjusted for sample signal | OR = 0.41 [0.25; 0.67], p = $4.5 \times 10^{-4}$ (177) |
| Logistic regression of detection, per 1% HbA1c | Affected and unaffected samples, adjusted for subset | OR = 0.62 [0.39; 0.98], p = 0.0406 (166) |
| Logistic regression of detection, per 1% HbA1c | Plausible profiles | OR = 0.69 [0.44; 1.08], p = 0.101 (115) |
| Logistic regression of detection, per 1% HbA1c | Plausible profiles, adjusted for sample signal | OR = 0.42 [0.23; 0.77], p = 0.00488 (115) |
| Logistic regression of detection, per 1% HbA1c | Unaffected samples | OR = 0.81 [0.40; 1.66], p = 0.571 (95) |
| Spearman ρ, log(C15:0/C16:0) vs log(C17:0/C16:0), where both detected | Full sample | +0.750 (p = $1.1 \times 10^{-15}$; 80) |
| Spearman ρ, log(C15:0/C16:0) vs log(C17:0/C16:0), where both detected | Affected samples | +0.882 (p = $1.3 \times 10^{-6}$; 18) |
| Spearman ρ, log(C15:0/C16:0) vs log(C17:0/C16:0), where both detected | Unaffected samples | +0.718 (p = $5.0 \times 10^{-11}$; 62) |
| Spearman ρ, log(C15:0/C16:0) vs log(C17:0/C16:0), where both detected | Plausible profiles | +0.753 (p = $4.5 \times 10^{-13}$; 65) |
| Spearman ρ with HbA1c, bootstrap 95% CI (5000 resamples); power for $\lvert\rho\rvert = 0.22$ | Full sample | −0.218 [−0.356; −0.072] (177); power 84% |
| Spearman ρ with HbA1c, bootstrap 95% CI (5000 resamples); power for $\lvert\rho\rvert = 0.22$ | Affected samples | −0.324 [−0.528; −0.100] (71); power 45% |
| Spearman ρ with HbA1c, bootstrap 95% CI (5000 resamples); power for $\lvert\rho\rvert = 0.22$ | Unaffected samples | −0.113 [−0.306; +0.092] (95); power 57% |
| Spearman ρ with HbA1c, bootstrap 95% CI (5000 resamples); power for $\lvert\rho\rvert = 0.22$ | Plausible profiles | −0.161 [−0.330; +0.023] (115); power 66% |
| Spearman ρ with HbA1c, bootstrap 95% CI (5000 resamples); power for $\lvert\rho\rvert = 0.22$ | Plausible, unaffected | −0.145 [−0.368; +0.083] (77); power 49% |

QC ratio, C17:0/C16:0 in the pooled QC sample (Table S1b). Tobit, censored normal regression of log C17:0 on standardized HbA1c, with non-detected values left-censored at the smallest detected value. Logistic models: detection of C17:0 (yes/no) on HbA1c per 1%, with, where stated, the number of the other 12 panel components detected (sample signal) or the processing subset as covariate; the nominal associations in the signal-adjusted models are not separable from the processing problem, because detection failures are concentrated in the affected samples. Bootstrap, percentile 95% CI from 5000 resamples. Power, two-sided $\alpha = 0.05$, Fisher z approximation, for $\lvert\rho\rvert = 0.22$ (the full-sample estimate).

**Table S6 (continued). F.** Regression of HbA1c with additional covariates (controls and prediabetes; n = 107).

| Fatty acid | Adjusted for age, sex, BMI | + smoking and antihypertensive medication | n |
|---|---|---|---|
| C17:0 | β = −0.139, p = 0.152 | β = −0.130, p = 0.191 | 107 |
| C18:2n-6 | β = +0.017, p = 0.859 | β = +0.026, p = 0.787 | 107 |

Standardized β per 1-SD increase in the fatty acid proportion. Smoking entered as any versus none; antihypertensive medication as yes/no. Diet and lipid-lowering medication were not recorded.

**Table S6 (continued). G.** Processing subset (duplication present, n = 71, versus trans component reported without duplication, n = 95) and participant characteristics.

| Characteristic | Test | p |
|---|---|---|
| Glycemic group | $\chi^2$ | 0.356 |
| HbA1c | Mann–Whitney | 0.192 |
| FPG | Mann–Whitney | 0.575 |
| Triglycerides | Mann–Whitney | 0.209 |
| HDL cholesterol | Mann–Whitney | 0.195 |
| LDL cholesterol | Mann–Whitney | 0.0407 |

| Characteristic | Test | p |
|---|---|---|
| BMI | Mann–Whitney | 0.658 |
| Age | Mann–Whitney | 0.722 |
| Data subset | $\chi^2$ | 0.585 |

No correction for multiple testing; with eight comparisons, the nominal difference in LDL cholesterol does not survive correction.

**Table S7.** Exact values for the correlation analyses. **A.** Unadjusted Spearman correlations, all participants (Table 4 of the main text).

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| HbA1c | C4:0 | −0.062 | 0.411 | 0.485 | 177 |
| HbA1c | C6:0 | −0.102 | 0.177 | 0.293 | 177 |
| HbA1c | C8:0 | −0.183 | 0.0146 | 0.063 | 177 |
| HbA1c | C12:0 | −0.146 | 0.0529 | 0.138 | 177 |
| HbA1c | C14:0 | −0.092 | 0.226 | 0.293 | 177 |
| HbA1c | C16:0 | +0.174 | 0.0204 | 0.066 | 177 |
| HbA1c | C16:1 | +0.034 | 0.656 | 0.656 | 177 |
| HbA1c | C17:0 | −0.218 | 0.00353 | 0.033 | 177 |
| HbA1c | C18:0 † | +0.095 | 0.207 | 0.293 | 177 |
| HbA1c | C18:1n-9 | +0.041 | 0.587 | 0.635 | 177 |
| HbA1c | C18:2n-6 | −0.210 | 0.00506 | 0.033 | 177 |
| HbA1c | C20:3n-6 | −0.111 | 0.14 | 0.293 | 177 |
| HbA1c | C24:0 | −0.098 | 0.193 | 0.293 | 177 |
| Fasting glucose | C4:0 | −0.049 | 0.513 | 0.596 | 177 |
| Fasting glucose | C6:0 | −0.024 | 0.755 | 0.755 | 177 |
| Fasting glucose | C8:0 | −0.122 | 0.107 | 0.230 | 177 |
| Fasting glucose | C12:0 | −0.141 | 0.0607 | 0.230 | 177 |
| Fasting glucose | C14:0 | +0.045 | 0.551 | 0.596 | 177 |
| Fasting glucose | C16:0 | +0.184 | 0.0143 | 0.093 | 177 |
| Fasting glucose | C16:1 | +0.080 | 0.29 | 0.455 | 177 |
| Fasting glucose | C17:0 | −0.117 | 0.119 | 0.230 | 177 |
| Fasting glucose | C18:0 † | −0.121 | 0.108 | 0.230 | 177 |
| Fasting glucose | C18:1n-9 | +0.209 | 0.00534 | 0.069 | 177 |
| Fasting glucose | C18:2n-6 | −0.076 | 0.315 | 0.455 | 177 |
| Fasting glucose | C20:3n-6 | −0.116 | 0.124 | 0.230 | 177 |
| Fasting glucose | C24:0 | −0.068 | 0.366 | 0.476 | 177 |
| BMI | C4:0 | −0.022 | 0.822 | 0.822 | 107 |
| BMI | C6:0 | −0.072 | 0.462 | 0.679 | 107 |
| BMI | C8:0 | −0.146 | 0.134 | 0.348 | 107 |
| BMI | C12:0 | −0.071 | 0.47 | 0.679 | 107 |
| BMI | C14:0 | −0.057 | 0.562 | 0.731 | 107 |
| BMI | C16:0 | +0.080 | 0.413 | 0.679 | 107 |
| BMI | C16:1 | +0.155 | 0.111 | 0.348 | 107 |
| BMI | C17:0 | −0.152 | 0.117 | 0.348 | 107 |
| BMI | C18:0 † | −0.030 | 0.755 | 0.818 | 107 |
| BMI | C18:1n-9 | +0.291 | 0.00234 | 0.030 | 107 |
| BMI | C18:2n-6 | −0.091 | 0.35 | 0.679 | 107 |
| BMI | C20:3n-6 | −0.186 | 0.055 | 0.348 | 107 |
| BMI | C24:0 | −0.040 | 0.679 | 0.802 | 107 |
| Triglycerides | C4:0 | −0.287 | 0.00249 | 0.011 | 109 |
| Triglycerides | C6:0 | −0.126 | 0.192 | 0.278 | 109 |
| Triglycerides | C8:0 | −0.104 | 0.28 | 0.364 | 109 |
| Triglycerides | C12:0 | −0.169 | 0.0793 | 0.147 | 109 |
| Triglycerides | C14:0 | +0.192 | 0.046 | 0.120 | 109 |
| Triglycerides | C16:0 | −0.177 | 0.0653 | 0.141 | 109 |
| Triglycerides | C16:1 | +0.319 | $7.3 \times 10^{-4}$ | 0.005 | 109 |
| Triglycerides | C17:0 | +0.040 | 0.677 | 0.800 | 109 |
| Triglycerides | C18:0 † | −0.236 | 0.0135 | 0.044 | 109 |
| Triglycerides | C18:1n-9 | +0.647 | $3.0 \times 10^{-14}$ | <0.001 | 109 |
| Triglycerides | C18:2n-6 | +0.000 | 1.000 | 1.000 | 109 |
| Triglycerides | C20:3n-6 | +0.008 | 0.937 | 1.000 | 109 |

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| Triglycerides | C24:0 | +0.128 | 0.186 | 0.278 | 109 |
| HDL-C | C4:0 | −0.078 | 0.419 | 0.621 | 109 |
| HDL-C | C6:0 | +0.160 | 0.0968 | 0.235 | 109 |
| HDL-C | C8:0 | +0.069 | 0.478 | 0.621 | 109 |
| HDL-C | C12:0 | +0.155 | 0.109 | 0.235 | 109 |
| HDL-C | C14:0 | +0.010 | 0.915 | 0.915 | 109 |
| HDL-C | C16:0 | −0.026 | 0.792 | 0.915 | 109 |
| HDL-C | C16:1 | +0.080 | 0.411 | 0.621 | 109 |
| HDL-C | C17:0 | +0.076 | 0.431 | 0.621 | 109 |
| HDL-C | C18:0 † | −0.013 | 0.892 | 0.915 | 109 |
| HDL-C | C18:1n-9 | −0.258 | 0.00676 | 0.088 | 109 |
| HDL-C | C18:2n-6 | +0.164 | 0.0884 | 0.235 | 109 |
| HDL-C | C20:3n-6 | +0.205 | 0.0323 | 0.210 | 109 |
| HDL-C | C24:0 | +0.164 | 0.088 | 0.235 | 109 |
| LDL-C | C4:0 | −0.212 | 0.0272 | 0.071 | 109 |
| LDL-C | C6:0 | +0.112 | 0.247 | 0.321 | 109 |
| LDL-C | C8:0 | +0.073 | 0.448 | 0.485 | 109 |
| LDL-C | C12:0 | +0.029 | 0.764 | 0.764 | 109 |
| LDL-C | C14:0 | +0.101 | 0.294 | 0.348 | 109 |
| LDL-C | C16:0 | −0.223 | 0.02 | 0.071 | 109 |
| LDL-C | C16:1 | +0.162 | 0.0916 | 0.154 | 109 |
| LDL-C | C17:0 | +0.150 | 0.12 | 0.174 | 109 |
| LDL-C | C18:0 † | −0.279 | 0.00328 | 0.021 | 109 |
| LDL-C | C18:1n-9 | +0.215 | 0.0247 | 0.071 | 109 |
| LDL-C | C18:2n-6 | +0.335 | $3.7 \times 10^{-4}$ | 0.005 | 109 |
| LDL-C | C20:3n-6 | +0.161 | 0.0946 | 0.154 | 109 |
| LDL-C | C24:0 | +0.179 | 0.0628 | 0.136 | 109 |

**Table S7 (continued). B.** Partial correlations adjusted for age, sex, BMI and waist circumference (Table 5 of the main text; Table S3A).

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| HbA1c | C4:0 | +0.075 | 0.443 | 0.751 | 107 |
| HbA1c | C6:0 | −0.083 | 0.397 | 0.751 | 107 |
| HbA1c | C8:0 | −0.171 | 0.0775 | 0.592 | 107 |
| HbA1c | C12:0 | −0.158 | 0.104 | 0.592 | 107 |
| HbA1c | C14:0 | −0.145 | 0.137 | 0.592 | 107 |
| HbA1c | C16:0 | −0.036 | 0.714 | 0.827 | 107 |
| HbA1c | C16:1 | −0.045 | 0.645 | 0.827 | 107 |
| HbA1c | C17:0 | −0.100 | 0.306 | 0.751 | 107 |
| HbA1c | C18:0 † | +0.069 | 0.483 | 0.751 | 107 |
| HbA1c | C18:1n-9 | +0.008 | 0.936 | 0.936 | 107 |
| HbA1c | C18:2n-6 | +0.029 | 0.764 | 0.827 | 107 |
| HbA1c | C20:3n-6 | −0.105 | 0.284 | 0.751 | 107 |
| HbA1c | C24:0 | −0.063 | 0.52 | 0.751 | 107 |
| Fasting glucose | C4:0 | +0.184 | 0.0581 | 0.374 | 107 |
| Fasting glucose | C6:0 | −0.054 | 0.584 | 0.814 | 107 |
| Fasting glucose | C8:0 | −0.147 | 0.131 | 0.427 | 107 |
| Fasting glucose | C12:0 | −0.167 | 0.0862 | 0.374 | 107 |
| Fasting glucose | C14:0 | +0.038 | 0.698 | 0.814 | 107 |
| Fasting glucose | C16:0 | −0.076 | 0.434 | 0.814 | 107 |
| Fasting glucose | C16:1 | +0.072 | 0.463 | 0.814 | 107 |
| Fasting glucose | C17:0 | +0.023 | 0.814 | 0.814 | 107 |
| Fasting glucose | C18:0 † | +0.028 | 0.778 | 0.814 | 107 |
| Fasting glucose | C18:1n-9 | +0.177 | 0.0689 | 0.374 | 107 |

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| Fasting glucose | C18:2n-6 | −0.127 | 0.192 | 0.500 | 107 |
| Fasting glucose | C20:3n-6 | −0.056 | 0.565 | 0.814 | 107 |
| Fasting glucose | C24:0 | −0.041 | 0.678 | 0.814 | 107 |
| Triglycerides | C4:0 | −0.313 | 0.00103 | 0.007 | 107 |
| Triglycerides | C6:0 | −0.103 | 0.289 | 0.418 | 107 |
| Triglycerides | C8:0 | −0.077 | 0.431 | 0.509 | 107 |
| Triglycerides | C12:0 | −0.175 | 0.0717 | 0.155 | 107 |
| Triglycerides | C14:0 | +0.163 | 0.0936 | 0.174 | 107 |
| Triglycerides | C16:0 | −0.260 | 0.00691 | 0.022 | 107 |
| Triglycerides | C16:1 | +0.247 | 0.0102 | 0.027 | 107 |
| Triglycerides | C17:0 | +0.028 | 0.776 | 0.776 | 107 |
| Triglycerides | C18:0 † | −0.274 | 0.00424 | 0.018 | 107 |
| Triglycerides | C18:1n-9 | +0.612 | $2.5 \times 10^{-12}$ | <0.001 | 107 |
| Triglycerides | C18:2n-6 | +0.082 | 0.4 | 0.509 | 107 |
| Triglycerides | C20:3n-6 | +0.070 | 0.473 | 0.512 | 107 |
| Triglycerides | C24:0 | +0.132 | 0.176 | 0.285 | 107 |
| HDL-C | C4:0 | −0.108 | 0.269 | 0.437 | 107 |
| HDL-C | C6:0 | +0.161 | 0.0972 | 0.253 | 107 |
| HDL-C | C8:0 | +0.081 | 0.407 | 0.529 | 107 |
| HDL-C | C12:0 | +0.189 | 0.0516 | 0.224 | 107 |
| HDL-C | C14:0 | +0.007 | 0.94 | 0.940 | 107 |
| HDL-C | C16:0 | −0.014 | 0.887 | 0.940 | 107 |
| HDL-C | C16:1 | +0.135 | 0.166 | 0.361 | 107 |
| HDL-C | C17:0 | +0.087 | 0.373 | 0.529 | 107 |
| HDL-C | C18:0 † | +0.044 | 0.651 | 0.769 | 107 |
| HDL-C | C18:1n-9 | −0.242 | 0.0121 | 0.157 | 107 |
| HDL-C | C18:2n-6 | +0.119 | 0.222 | 0.412 | 107 |
| HDL-C | C20:3n-6 | +0.161 | 0.0975 | 0.253 | 107 |
| HDL-C | C24:0 | +0.191 | 0.0492 | 0.224 | 107 |
| LDL-C | C4:0 | −0.178 | 0.067 | 0.218 | 107 |
| LDL-C | C6:0 | +0.137 | 0.158 | 0.257 | 107 |
| LDL-C | C8:0 | +0.103 | 0.292 | 0.379 | 107 |
| LDL-C | C12:0 | +0.024 | 0.808 | 0.808 | 107 |
| LDL-C | C14:0 | +0.057 | 0.561 | 0.607 | 107 |
| LDL-C | C16:0 | −0.240 | 0.0128 | 0.056 | 107 |
| LDL-C | C16:1 | +0.092 | 0.346 | 0.409 | 107 |
| LDL-C | C17:0 | +0.129 | 0.186 | 0.268 | 107 |
| LDL-C | C18:0 † | −0.261 | 0.00667 | 0.043 | 107 |
| LDL-C | C18:1n-9 | +0.141 | 0.146 | 0.257 | 107 |
| LDL-C | C18:2n-6 | +0.389 | $3.4 \times 10^{-5}$ | <0.001 | 107 |
| LDL-C | C20:3n-6 | +0.147 | 0.13 | 0.257 | 107 |
| LDL-C | C24:0 | +0.156 | 0.109 | 0.257 | 107 |

**Table S7 (continued). C.** Unadjusted Spearman correlations, biochemically plausible profiles.

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| HbA1c | C4:0 | +0.005 | 0.962 | 0.962 | 115 |
| HbA1c | C6:0 | −0.038 | 0.683 | 0.808 | 115 |
| HbA1c | C8:0 | −0.120 | 0.201 | 0.523 | 115 |
| HbA1c | C12:0 | −0.106 | 0.258 | 0.558 | 115 |
| HbA1c | C14:0 | −0.022 | 0.819 | 0.887 | 115 |
| HbA1c | C16:0 | +0.143 | 0.128 | 0.416 | 115 |
| HbA1c | C16:1 | +0.092 | 0.33 | 0.558 | 115 |
| HbA1c | C17:0 | −0.161 | 0.0863 | 0.416 | 115 |
| HbA1c | C18:0 † | +0.089 | 0.344 | 0.558 | 115 |

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| HbA1c | C18:1n-9 | +0.143 | 0.128 | 0.416 | 115 |
| HbA1c | C18:2n-6 | −0.272 | 0.00322 | 0.042 | 115 |
| HbA1c | C20:3n-6 | −0.049 | 0.605 | 0.786 | 115 |
| HbA1c | C24:0 | −0.055 | 0.563 | 0.786 | 115 |
| Fasting glucose | C4:0 | −0.049 | 0.601 | 0.781 | 115 |
| Fasting glucose | C6:0 | −0.116 | 0.216 | 0.312 | 115 |
| Fasting glucose | C8:0 | −0.204 | 0.0287 | 0.075 | 115 |
| Fasting glucose | C12:0 | −0.221 | 0.0179 | 0.075 | 115 |
| Fasting glucose | C14:0 | +0.037 | 0.694 | 0.820 | 115 |
| Fasting glucose | C16:0 | +0.244 | 0.0087 | 0.057 | 115 |
| Fasting glucose | C16:1 | +0.015 | 0.873 | 0.946 | 115 |
| Fasting glucose | C17:0 | −0.204 | 0.0287 | 0.075 | 115 |
| Fasting glucose | C18:0 † | +0.006 | 0.952 | 0.952 | 115 |
| Fasting glucose | C18:1n-9 | +0.167 | 0.0748 | 0.162 | 115 |
| Fasting glucose | C18:2n-6 | −0.268 | 0.00381 | 0.050 | 115 |
| Fasting glucose | C20:3n-6 | −0.118 | 0.208 | 0.312 | 115 |
| Fasting glucose | C24:0 | −0.121 | 0.198 | 0.312 | 115 |
| BMI | C4:0 | −0.059 | 0.627 | 0.680 | 71 |
| BMI | C6:0 | −0.071 | 0.556 | 0.676 | 71 |
| BMI | C8:0 | −0.152 | 0.207 | 0.384 | 71 |
| BMI | C12:0 | −0.083 | 0.493 | 0.676 | 71 |
| BMI | C14:0 | −0.074 | 0.539 | 0.676 | 71 |
| BMI | C16:0 | −0.068 | 0.572 | 0.676 | 71 |
| BMI | C16:1 | +0.241 | 0.0429 | 0.173 | 71 |
| BMI | C17:0 | −0.190 | 0.113 | 0.246 | 71 |
| BMI | C18:0 † | +0.221 | 0.0644 | 0.173 | 71 |
| BMI | C18:1n-9 | +0.265 | 0.0252 | 0.173 | 71 |
| BMI | C18:2n-6 | −0.240 | 0.0436 | 0.173 | 71 |
| BMI | C20:3n-6 | −0.219 | 0.0664 | 0.173 | 71 |
| BMI | C24:0 | −0.004 | 0.973 | 0.973 | 71 |
| Triglycerides | C4:0 | −0.270 | 0.0218 | 0.041 | 72 |
| Triglycerides | C6:0 | −0.383 | $8.9 \times 10^{-4}$ | 0.005 | 72 |
| Triglycerides | C8:0 | −0.249 | 0.0349 | 0.053 | 72 |
| Triglycerides | C12:0 | −0.296 | 0.0117 | 0.030 | 72 |
| Triglycerides | C14:0 | +0.054 | 0.652 | 0.652 | 72 |
| Triglycerides | C16:0 | −0.284 | 0.0157 | 0.034 | 72 |
| Triglycerides | C16:1 | +0.332 | 0.0044 | 0.014 | 72 |
| Triglycerides | C17:0 | −0.087 | 0.469 | 0.554 | 72 |
| Triglycerides | C18:0 † | +0.246 | 0.0369 | 0.053 | 72 |
| Triglycerides | C18:1n-9 | +0.742 | $9.2 \times 10^{-14}$ | <0.001 | 72 |
| Triglycerides | C18:2n-6 | −0.378 | 0.00106 | 0.005 | 72 |
| Triglycerides | C20:3n-6 | −0.113 | 0.345 | 0.449 | 72 |
| Triglycerides | C24:0 | +0.054 | 0.651 | 0.652 | 72 |
| HDL-C | C4:0 | −0.078 | 0.514 | 0.556 | 72 |
| HDL-C | C6:0 | +0.256 | 0.0302 | 0.098 | 72 |
| HDL-C | C8:0 | +0.110 | 0.357 | 0.422 | 72 |
| HDL-C | C12:0 | +0.150 | 0.207 | 0.337 | 72 |
| HDL-C | C14:0 | +0.067 | 0.578 | 0.578 | 72 |
| HDL-C | C16:0 | +0.127 | 0.288 | 0.398 | 72 |
| HDL-C | C16:1 | +0.122 | 0.306 | 0.398 | 72 |
| HDL-C | C17:0 | +0.155 | 0.193 | 0.337 | 72 |
| HDL-C | C18:0 † | −0.297 | 0.0113 | 0.049 | 72 |
| HDL-C | C18:1n-9 | −0.337 | 0.00374 | 0.049 | 72 |

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| HDL-C | C18:2n-6 | +0.312 | 0.00762 | 0.049 | 72 |
| HDL-C | C20:3n-6 | +0.242 | 0.0403 | 0.105 | 72 |
| HDL-C | C24:0 | +0.194 | 0.103 | 0.222 | 72 |
| LDL-C | C4:0 | −0.214 | 0.071 | 0.308 | 72 |
| LDL-C | C6:0 | −0.062 | 0.605 | 0.918 | 72 |
| LDL-C | C8:0 | −0.072 | 0.549 | 0.918 | 72 |
| LDL-C | C12:0 | −0.070 | 0.559 | 0.918 | 72 |
| LDL-C | C14:0 | −0.143 | 0.229 | 0.745 | 72 |
| LDL-C | C16:0 | −0.225 | 0.0569 | 0.308 | 72 |
| LDL-C | C16:1 | +0.015 | 0.897 | 0.972 | 72 |
| LDL-C | C17:0 | −0.021 | 0.863 | 0.972 | 72 |
| LDL-C | C18:0 † | −0.077 | 0.52 | 0.918 | 72 |
| LDL-C | C18:1n-9 | −0.000 | 0.998 | 0.998 | 72 |
| LDL-C | C18:2n-6 | +0.283 | 0.0159 | 0.206 | 72 |
| LDL-C | C20:3n-6 | −0.016 | 0.896 | 0.972 | 72 |
| LDL-C | C24:0 | +0.057 | 0.635 | 0.918 | 72 |

**Table S7 (continued). D.** Partial correlations, biochemically plausible profiles (Table S3B).

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| HbA1c | C4:0 | +0.144 | 0.231 | 0.729 | 71 |
| HbA1c | C6:0 | −0.013 | 0.914 | 0.915 | 71 |
| HbA1c | C8:0 | −0.155 | 0.198 | 0.729 | 71 |
| HbA1c | C12:0 | −0.109 | 0.367 | 0.729 | 71 |
| HbA1c | C14:0 | −0.182 | 0.128 | 0.729 | 71 |
| HbA1c | C16:0 | −0.081 | 0.503 | 0.729 | 71 |
| HbA1c | C16:1 | −0.076 | 0.53 | 0.729 | 71 |
| HbA1c | C17:0 | −0.097 | 0.422 | 0.729 | 71 |
| HbA1c | C18:0 † | +0.143 | 0.235 | 0.729 | 71 |
| HbA1c | C18:1n-9 | +0.059 | 0.626 | 0.739 | 71 |
| HbA1c | C18:2n-6 | −0.013 | 0.915 | 0.915 | 71 |
| HbA1c | C20:3n-6 | −0.070 | 0.56 | 0.729 | 71 |
| HbA1c | C24:0 | −0.115 | 0.34 | 0.729 | 71 |
| Fasting glucose | C4:0 | +0.168 | 0.16 | 0.412 | 71 |
| Fasting glucose | C6:0 | −0.056 | 0.646 | 0.903 | 71 |
| Fasting glucose | C8:0 | −0.157 | 0.19 | 0.412 | 71 |
| Fasting glucose | C12:0 | −0.158 | 0.188 | 0.412 | 71 |
| Fasting glucose | C14:0 | −0.015 | 0.904 | 0.927 | 71 |
| Fasting glucose | C16:0 | −0.030 | 0.804 | 0.927 | 71 |
| Fasting glucose | C16:1 | +0.011 | 0.927 | 0.927 | 71 |
| Fasting glucose | C17:0 | −0.047 | 0.694 | 0.903 | 71 |
| Fasting glucose | C18:0 † | +0.127 | 0.291 | 0.474 | 71 |
| Fasting glucose | C18:1n-9 | +0.158 | 0.187 | 0.412 | 71 |
| Fasting glucose | C18:2n-6 | −0.300 | 0.0109 | 0.142 | 71 |
| Fasting glucose | C20:3n-6 | −0.158 | 0.189 | 0.412 | 71 |
| Fasting glucose | C24:0 | −0.129 | 0.286 | 0.474 | 71 |
| Triglycerides | C4:0 | −0.280 | 0.0182 | 0.039 | 71 |
| Triglycerides | C6:0 | −0.315 | 0.00752 | 0.026 | 71 |
| Triglycerides | C8:0 | −0.229 | 0.0549 | 0.089 | 71 |
| Triglycerides | C12:0 | −0.272 | 0.0219 | 0.041 | 71 |
| Triglycerides | C14:0 | +0.062 | 0.606 | 0.717 | 71 |
| Triglycerides | C16:0 | −0.331 | 0.00483 | 0.026 | 71 |
| Triglycerides | C16:1 | +0.290 | 0.0143 | 0.037 | 71 |
| Triglycerides | C17:0 | −0.091 | 0.451 | 0.652 | 71 |
| Triglycerides | C18:0 † | +0.078 | 0.516 | 0.670 | 71 |

| Clinical parameter | Fatty acid | Coefficient | p | q | n |
|---|---|---|---|---|---|
| Triglycerides | C18:1n-9 | +0.735 | $3.1 \times 10^{-13}$ | <0.001 | 71 |
| Triglycerides | C18:2n-6 | −0.313 | 0.00791 | 0.026 | 71 |
| Triglycerides | C20:3n-6 | −0.034 | 0.777 | 0.777 | 71 |
| Triglycerides | C24:0 | +0.052 | 0.666 | 0.722 | 71 |
| HDL-C | C4:0 | −0.097 | 0.421 | 0.498 | 71 |
| HDL-C | C6:0 | +0.165 | 0.169 | 0.345 | 71 |
| HDL-C | C8:0 | +0.099 | 0.409 | 0.498 | 71 |
| HDL-C | C12:0 | +0.151 | 0.209 | 0.345 | 71 |
| HDL-C | C14:0 | +0.037 | 0.76 | 0.760 | 71 |
| HDL-C | C16:0 | +0.079 | 0.514 | 0.557 | 71 |
| HDL-C | C16:1 | +0.127 | 0.293 | 0.423 | 71 |
| HDL-C | C17:0 | +0.150 | 0.212 | 0.345 | 71 |
| HDL-C | C18:0 † | −0.171 | 0.155 | 0.345 | 71 |
| HDL-C | C18:1n-9 | −0.357 | 0.00223 | 0.029 | 71 |
| HDL-C | C18:2n-6 | +0.307 | 0.00922 | 0.060 | 71 |
| HDL-C | C20:3n-6 | +0.238 | 0.0457 | 0.198 | 71 |
| HDL-C | C24:0 | +0.204 | 0.0886 | 0.288 | 71 |
| LDL-C | C4:0 | −0.181 | 0.13 | 0.424 | 71 |
| LDL-C | C6:0 | +0.002 | 0.987 | 0.987 | 71 |
| LDL-C | C8:0 | −0.063 | 0.603 | 0.795 | 71 |
| LDL-C | C12:0 | −0.094 | 0.437 | 0.795 | 71 |
| LDL-C | C14:0 | −0.201 | 0.0934 | 0.405 | 71 |
| LDL-C | C16:0 | −0.220 | 0.0648 | 0.405 | 71 |
| LDL-C | C16:1 | −0.054 | 0.656 | 0.795 | 71 |
| LDL-C | C17:0 | −0.051 | 0.672 | 0.795 | 71 |
| LDL-C | C18:0 † | −0.054 | 0.657 | 0.795 | 71 |
| LDL-C | C18:1n-9 | −0.072 | 0.548 | 0.795 | 71 |
| LDL-C | C18:2n-6 | +0.347 | 0.00301 | 0.039 | 71 |
| LDL-C | C20:3n-6 | −0.073 | 0.544 | 0.795 | 71 |
| LDL-C | C24:0 | +0.017 | 0.89 | 0.964 | 71 |

Coefficient, Spearman ϱ (A, C) or partial correlation r (B, D). q, Benjamini–Hochberg adjusted p within each clinical parameter across the 13 fatty acids. HbA1c and FPG include all three glycemic groups; the other parameters include controls and prediabetes only. Correlations reaching $q < 0.05$ only in the plausible profiles (panels C and D) are reported for completeness and are not interpreted in the main text. † Not interpretable (Note S1.5). Shorthand notation: Cx:y, x carbon atoms and y double bonds; n-z, position of the first double bond from the methyl end. Common and systematic names of all components are given in Table S1A.