Supplementary Material

Table S1: For the following days and lipid species we did not collect lipidomic data and hence interpolated the missing values with the average value for each respective species.

| Day | Strains | Interpolated Lipid Species                                                                 |
|-----|---------|-------------------------------------------------------------------------------------------|
| 3   | $N_2$   | PS 34:1, PS 34:2, PS 36:4, PS 36:5, PS 34:2.1, PS 36:1, PS 36:2, PS 40:7, PS 38:0, PS 38:4, PS 38:5, PS 40:12, PS 40:6 |
| 10  | $mev-1$ | SM 31:1, SM 34:1, SM 35:0, SM 36:3, SM 36:2, SM 36:1, SM 36:0, SM 38:4, SM 38:3, SM 38:2, SM 38:1, SM 38:0, SM 39:0, SM 40:1, SM 40:0, SM 41:2, SM 41:1, SM 42:2, SM 42:1, SM 42:0 |
|     |         | PC 28:1, PC 29:0, PC 29:1, PC 30:0, PC 30:1, PC 31:1, PC 32:0, PC 32:1, PC 32:2, PC 32:3, PC 33:1, PC 34:1, PC 34:2 |
|     |         | PC 34:3, PC 34:4, PC 34:5, PC 35:1, PC 36:0, PC 36:1, PC 36:2, PC 36:3, PC 36:4, PC 36:5, PC 36:6, PC 38:0, PC 38:1, PC 38:2, PC 38:3, PC 38:4, PC 38:5, PC 38:6, PC 38:7, PC 40:0, PC 40:1, PC 40:4, PC 40:5, PC 40:6, PC 40:7, PC 40:8, PC 44:0, PC 44:2, PE 30:1, PE 32:0, PE 34:1, PE 34:2, PE 34:3, PE 34:4, PE 34:5, PE 35:1, PE 36:0, PE 36:1, PE 36:2, PE 36:3, PE 36:4, PE 36:5, PE 38:3, PE 38:4, PE 38:5, PE 38:6, PE 40:5 |
| 10  | $eat-2$ | PE 30:1, PE 32:0, PE 34:1, PE 34:2, PE 34:3, PE 34:4, PE 34:5, PE 35:1, PE 36:0, PE 36:1, PE 36:2, PE 36:3, PE 36:4, PE 36:5, PE 38:3, PE 38:4, PE 38:5, PE 38:6, PE 40:5 |

Table S2: Samples collected

For each strain, samples were collected in triplicate at each timepoint. For WT $N_2$ and both of the long-lived $age-1$ and $eat-2$ strains, triplicate (3) samples were collected on day 3, 5, 10, 15 and 20 of life. For the short-lived $mev-1$ strain, samples were only collected up to (including) day 10 as animals of this strain start to die off after this age.

| Strain | Age: | 3 days | 5 days | 10 days | 15 days | 20 days | Samples |
|--------|------|--------|--------|---------|---------|---------|---------|
| N2 WT  | 3    | 3      | 3      | 3       | 3       | 3       | 15      |
| $age-1$ | 3    | 3      | 3      | 3       | 3       | 3       | 15      |
| $eat-2$ | 3    | 3      | 3      | 3       | 3       | 3       | 15      |
| $mev-1$ | 3    | 3      | 3      | 0       | 0       | 0       | 9       |
| Samples: | 12  | 12     | 12     | 9       | 9       |         | Total: 54 |
Figure S1: Explained Variance by each principal component

Figure S2: Plot of the first 2 Principal Components
Table S3: Weight assigned for each principal component by the elastic net model:

| Principal Component | Weight of the Principal Component in the model |
|---------------------|-----------------------------------------------|
| 1                   | 0.24493956                                    |
| 2                   | 0.61887164                                    |
| 5                   | 0.05166389                                    |
| 6                   | 0.36068704                                    |
| 7                   | -0.07221047                                   |
| 9                   | -0.22351026                                   |
| 10                  | 0.16122654                                    |
| 12                  | -0.34113561                                   |
| 13                  | 0.06172371                                    |
| 15                  | 0.44233765                                    |
| 18                  | -0.09540104                                   |
| 19                  | 0.24626368                                    |
| 20                  | 0.86748846                                    |
| 21                  | 0.59345682                                    |
| 22                  | -0.6973369                                    |
| 23                  | -0.76140243                                   |
| 24                  | -0.5191236                                    |
| 25                  | -0.0309329                                    |
| 27                  | -0.10155841                                   |
| 33                  | -0.29564258                                   |
| 39                  | -0.1586736                                    |
| 42                  | -0.46037303                                   |
| 46                  | -0.13997863                                   |
| 52                  | 0.12513804                                    |
| Intercept           | 8.727458050992002                             |