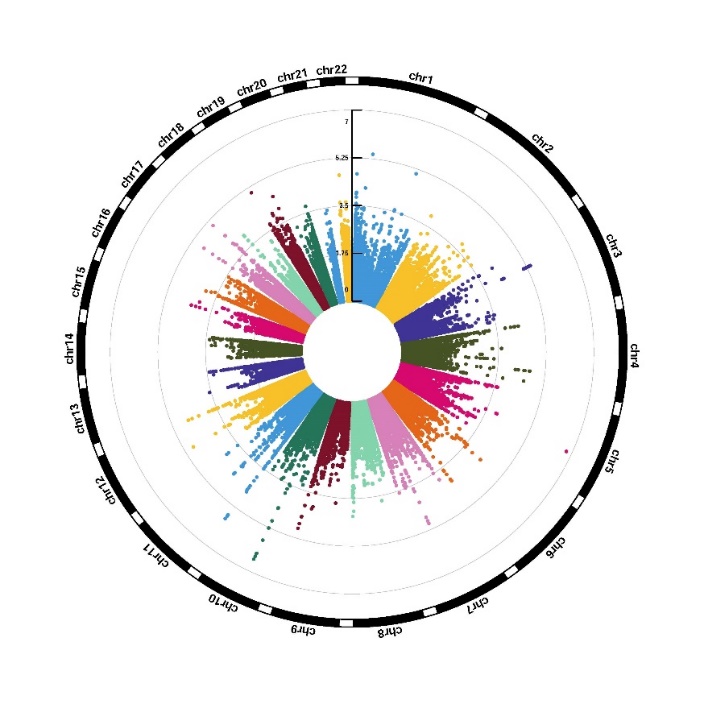
**Journal**: Twin Research and Human Genetics

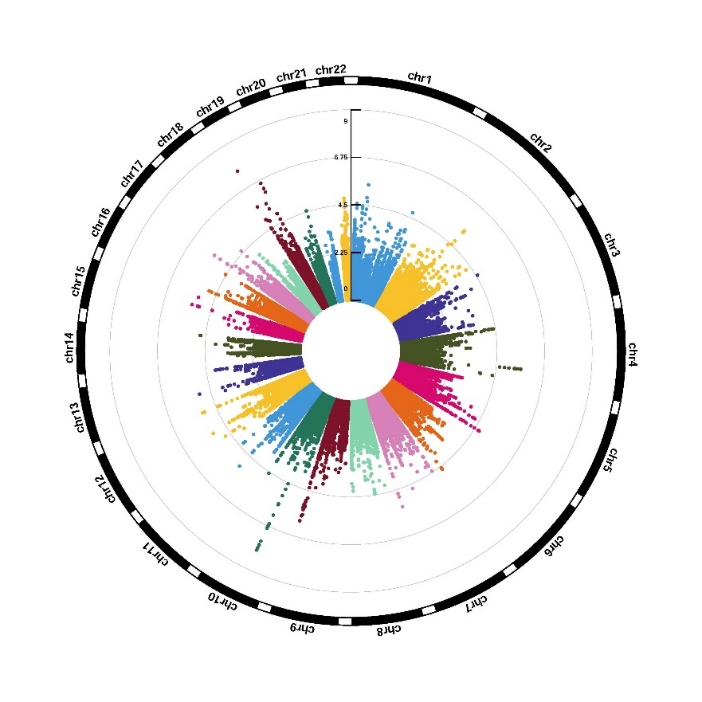
**Title**: DNA methylation mediated the association of body mass index with blood pressure in Chinese monozygotic twins

**Authors**: Jie Yao, Feng Ning, Weijing Wang, Dongfeng Zhang

(a)



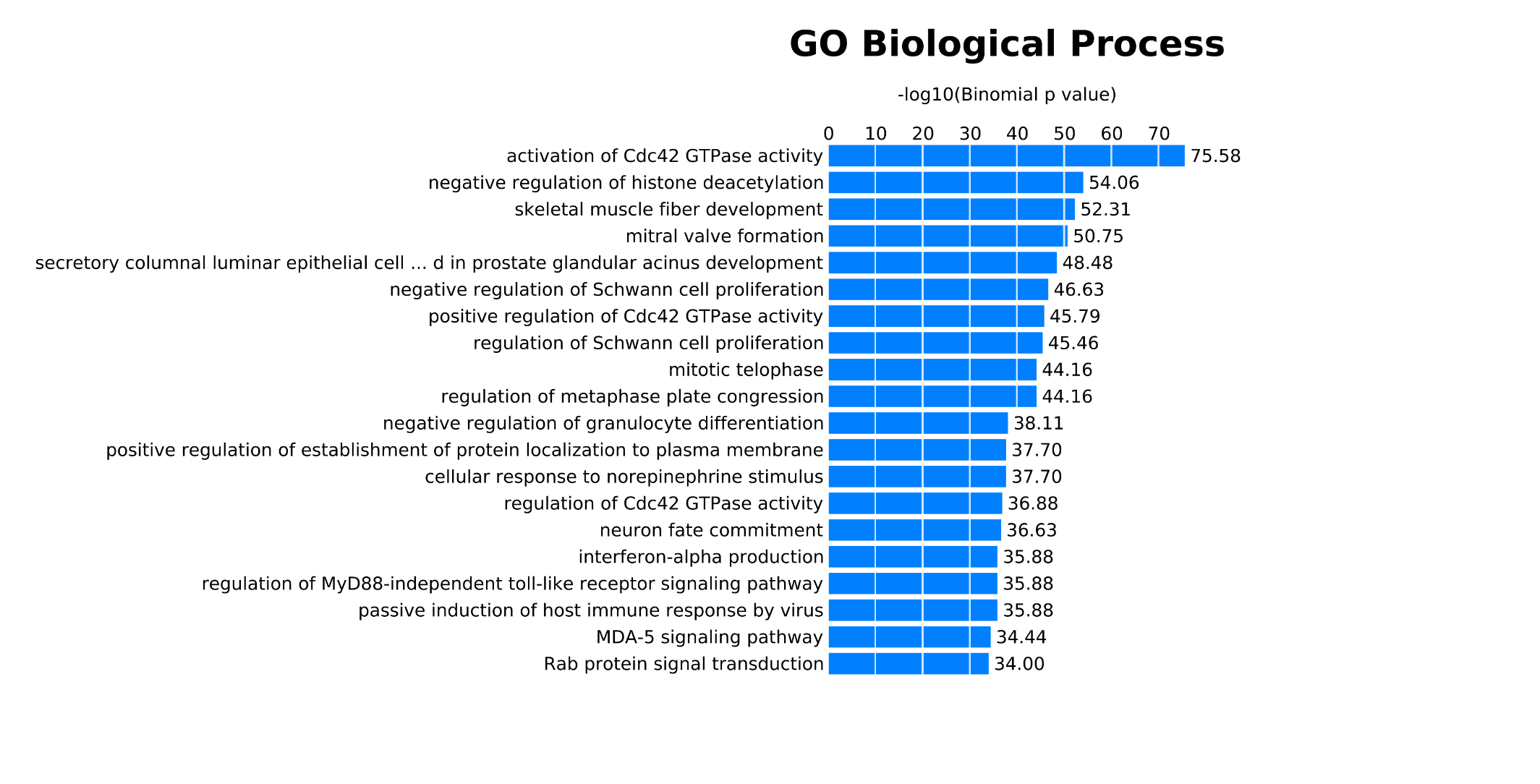
(b)



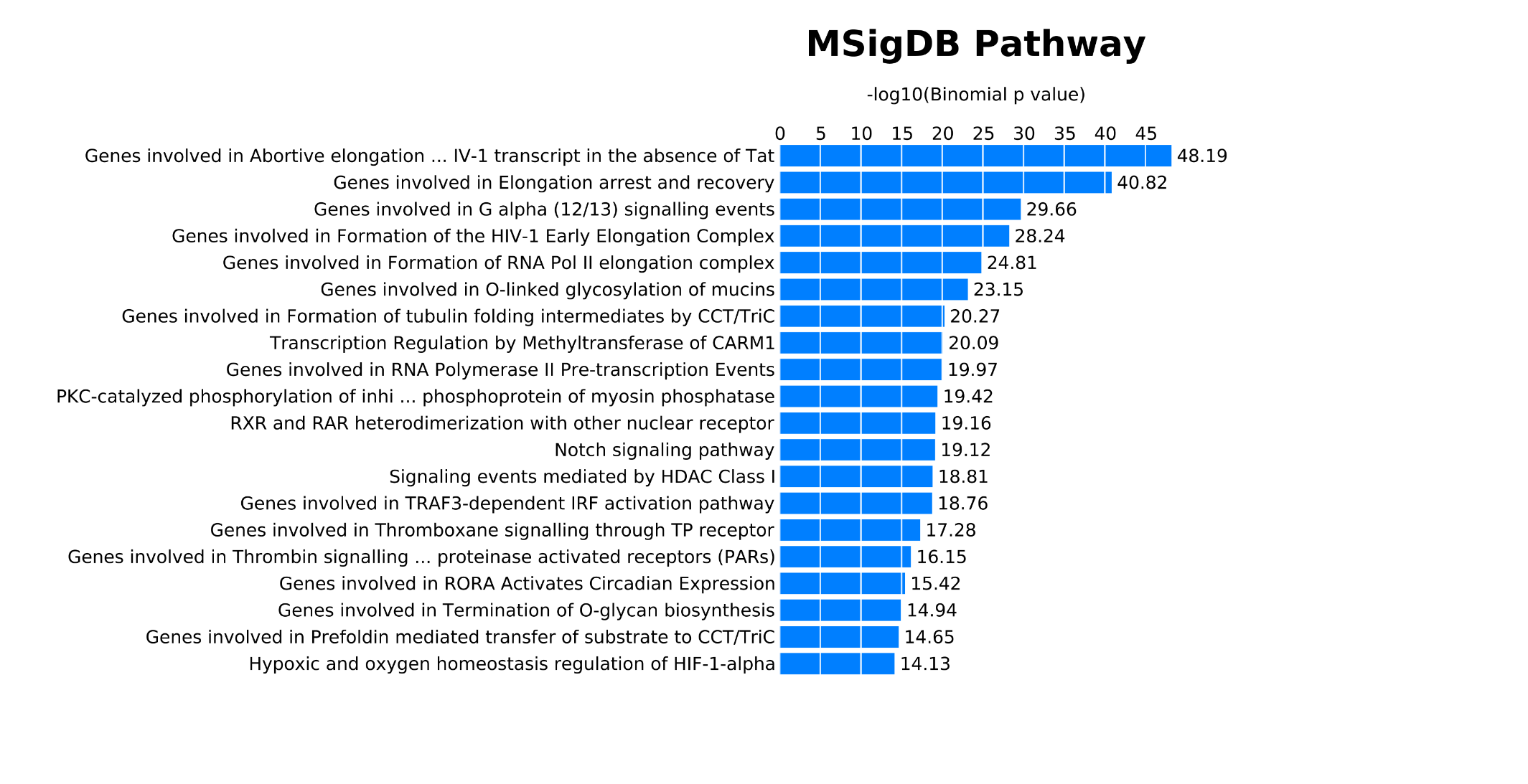
**Fig. S1**. Circular Manhattan plots for genome-wide DNA methylation analysis of BMI. (a) BMI-systolic blood pressure; (b) BMI-diastolic blood pressure. The numbers of chromosome and the -log10 of *P*-values for statistical significance are shown. The dots represent the observed CpGs.

**BMI-SBP**

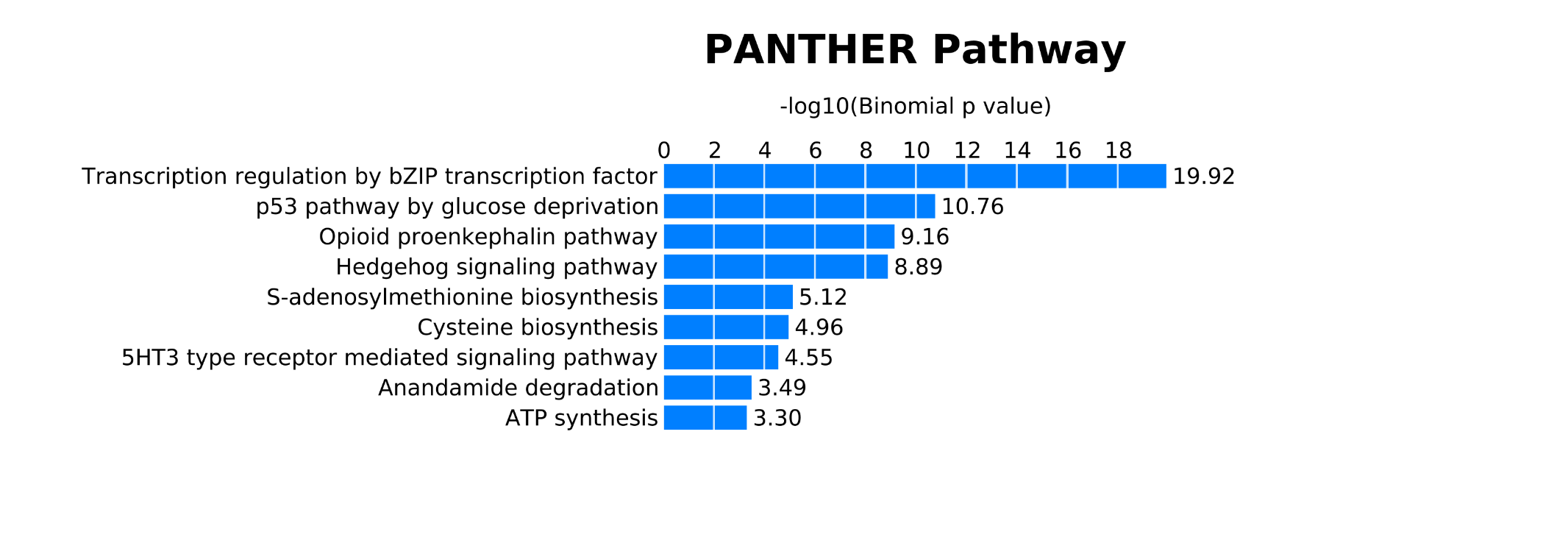
(a)

****

(b)

****

(c)

****

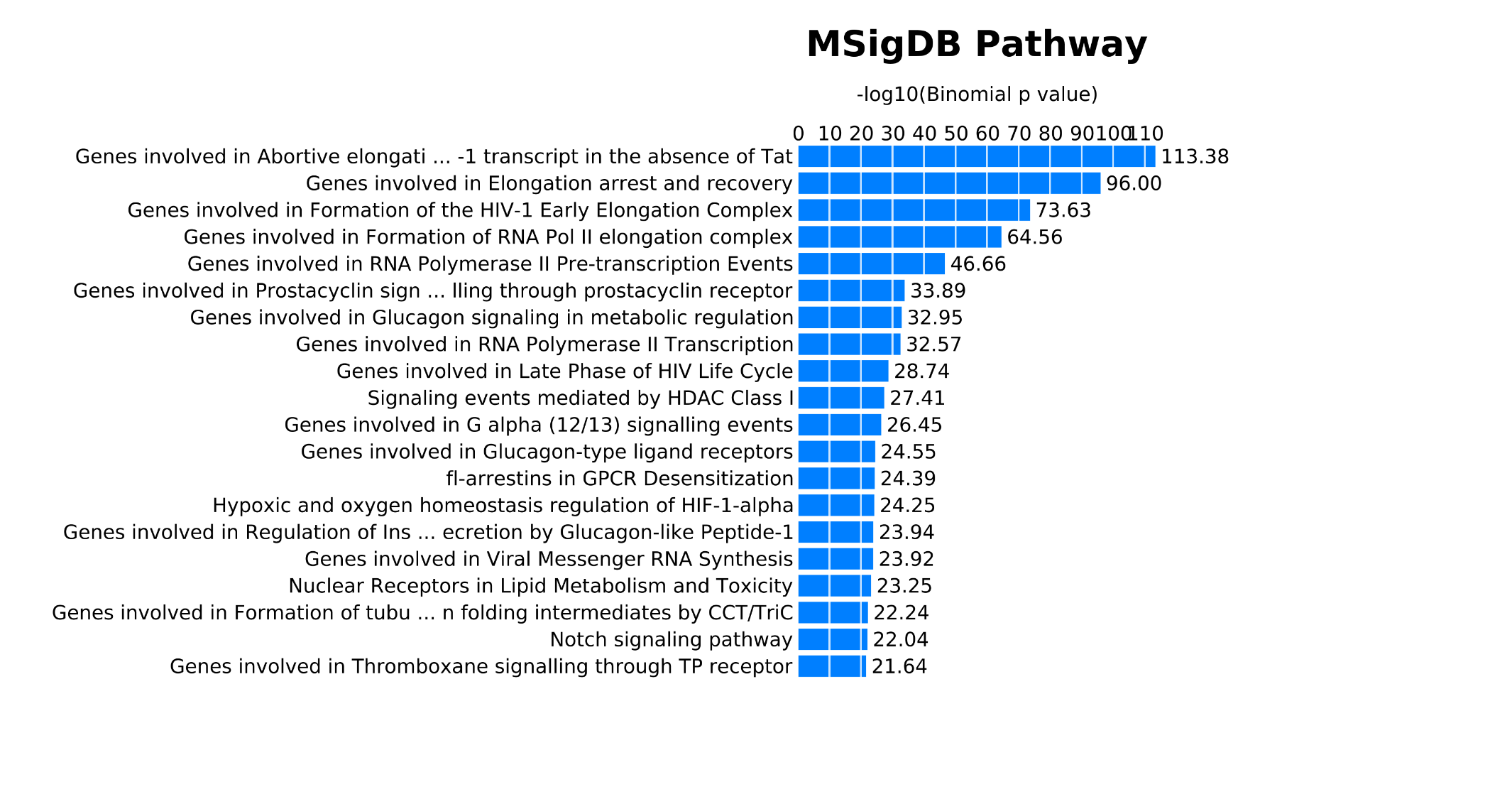
**BMI-DBP**

(a)

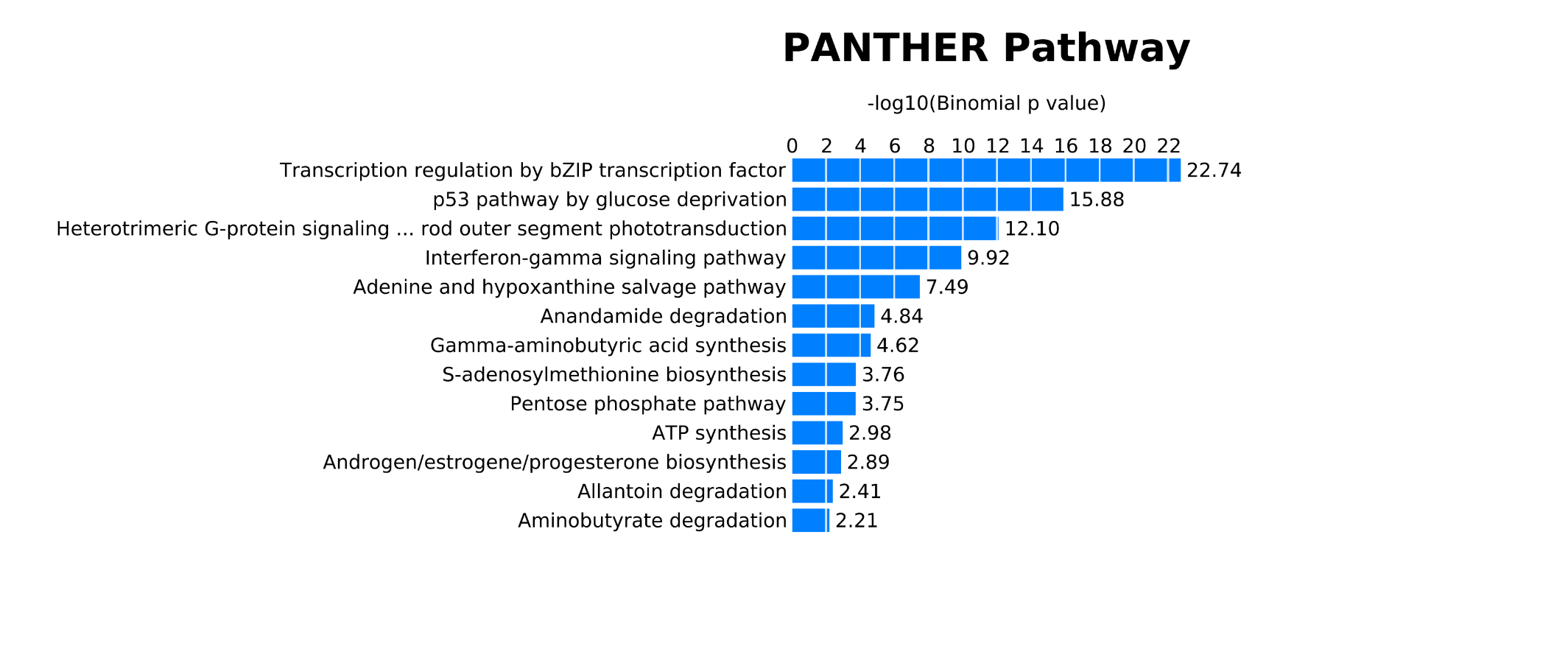
**表格

描述已自动生成**

(b)

****

(c)



**Fig. S2**. The bar chart of top 20 GREAT ontology enrichments potentially related to BMI by using binomial test based on CpGs with *P*-values < 0.05 identified in Model 2. (a) GO-Biological Process; (b) MSigDB Pathway; (c)PANTHER Pathway. The *x*-axis represents the -log10 of Binomial *P*-values and the *y*-axis shows the names of ontology enrichments. DBP, diastolic blood pressure; SBP, systolic blood pressure.

**SBP**

(a)

**图片包含 文本

描述已自动生成**

(b)

**表格

中度可信度描述已自动生成**

(c)

**日程表

描述已自动生成**

**DBP**

(a)

**表格

描述已自动生成**

(b)

**日程表

描述已自动生成**

**Fig. S3**. The bar chart of GREAT ontology enrichments potentially related to blood pressure by using binomial test based on CpGs with *P*-values < 0.05 identified in Model 3. (a) GO-Biological Process; (b)MSigDB Pathway; (c)PANTHER Pathway. The *x*-axis represents the -log10 of Binomial *P*-values and the *y*-axis shows the names of ontology enrichments. DBP, diastolic blood pressure; SBP, systolic blood pressure.

**Table S1**. The top five components from ReFACTor method on systolic blood pressure

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Family\_ID** | **Intra-pair** | **PC1** | **PC2** | **PC3** | **PC4** | **PC5** |
| 1 | 1 | 248.594 | 4.685 | -12.566 | 198.866 | -36.496 |
| 1 | 2 | 249.217 | 6.090 | -34.902 | 331.197 | -58.122 |
| 2 | 1 | -125.245 | 24.550 | 27.844 | 56.046 | -36.576 |
| 2 | 2 | -103.620 | -0.059 | 51.026 | 41.494 | -17.026 |
| 3 | 1 | 227.444 | 124.564 | -19.830 | -23.990 | -90.234 |
| 3 | 2 | 535.019 | -89.984 | 207.864 | -310.211 | -696.147 |
| 4 | 1 | -54.400 | -49.920 | 88.107 | 3.206 | 61.625 |
| 4 | 2 | 72.997 | -168.392 | 419.273 | 51.298 | 243.818 |
| 5 | 1 | 228.566 | -24.446 | 6.570 | 170.276 | 96.017 |
| 5 | 2 | 193.504 | -4.127 | -50.677 | 133.829 | 58.820 |
| 6 | 1 | 201.634 | 15.006 | 31.235 | 88.222 | 95.933 |
| 6 | 2 | 39.504 | 35.679 | -40.632 | 50.989 | 49.541 |
| 7 | 1 | -109.518 | 23.313 | 32.544 | 41.052 | -12.357 |
| 7 | 2 | -15.326 | -48.927 | 310.995 | 85.056 | 65.934 |
| 8 | 1 | 14.352 | 51.777 | -29.861 | 67.945 | 9.692 |
| 8 | 2 | 252.192 | -10.004 | -29.052 | 151.554 | 8.804 |
| 9 | 1 | 13.093 | 52.848 | -46.475 | 70.665 | 8.543 |
| 9 | 2 | -18.013 | 87.532 | -76.183 | 100.536 | -40.003 |
| 10 | 1 | 277.327 | 49.804 | 59.730 | -32.885 | 127.370 |
| 10 | 2 | 380.185 | -28.618 | -12.668 | -42.862 | 98.979 |
| 11 | 1 | -96.456 | -4.847 | 60.902 | 36.787 | 1.998 |
| 11 | 2 | -121.503 | 22.668 | 34.895 | 56.042 | -36.861 |
| 12 | 1 | -95.877 | -8.989 | 60.409 | 45.865 | -8.278 |
| 12 | 2 | -126.109 | 26.297 | 21.266 | 58.550 | -46.472 |
| 13 | 1 | 22.578 | 35.374 | -32.977 | 64.658 | 16.776 |
| 13 | 2 | -27.485 | 40.571 | -35.296 | 52.799 | -2.808 |
| 14 | 1 | -111.272 | 10.096 | 33.820 | 49.514 | -31.337 |
| 14 | 2 | -122.639 | 18.576 | 29.778 | 56.399 | -45.212 |
| 15 | 1 | -113.628 | 12.546 | 29.884 | 53.905 | -30.772 |
| 15 | 2 | -80.167 | 7.244 | 104.064 | 80.414 | -40.173 |
| 16 | 1 | 101.351 | 67.921 | -54.750 | 230.666 | -72.272 |
| 16 | 2 | -72.331 | 92.384 | -73.461 | 91.550 | -59.525 |
| 17 | 1 | -68.252 | -3.452 | 55.823 | -45.708 | 24.984 |
| 17 | 2 | -88.674 | 66.975 | 49.671 | -29.810 | -59.295 |
| 18 | 1 | -117.069 | -6.738 | 36.120 | 53.992 | -37.175 |
| 18 | 2 | -49.860 | -55.206 | 114.988 | 92.207 | -47.657 |
| 19 | 1 | -45.364 | 50.010 | -36.864 | 64.484 | -17.782 |
| 19 | 2 | 47.519 | 47.655 | -29.750 | 89.408 | 3.250 |
| 20 | 1 | -92.254 | 14.951 | 55.451 | 78.160 | -59.519 |
| 20 | 2 | -110.057 | 7.326 | 30.664 | 43.260 | -27.140 |
| 21 | 1 | -37.662 | -36.472 | 147.484 | 57.949 | 8.446 |
| 21 | 2 | -137.215 | 30.331 | 5.593 | 49.924 | -57.247 |
| 22 | 1 | -150.446 | 38.668 | 5.397 | 63.158 | -73.095 |
| 22 | 2 | -69.863 | -19.671 | 79.808 | 45.808 | -14.043 |
| 23 | 1 | 8.157 | 93.633 | -46.599 | 121.707 | -43.023 |
| 23 | 2 | -65.212 | 83.122 | -75.661 | 72.041 | -39.372 |
| 24 | 1 | -51.881 | -18.564 | 72.708 | -80.471 | 40.246 |
| 24 | 2 | 6.308 | -12.800 | 171.875 | -102.077 | 38.896 |
| 25 | 1 | -106.703 | 38.863 | 13.516 | -36.378 | -25.641 |
| 25 | 2 | -91.591 | 51.390 | 56.562 | -34.250 | -35.233 |
| 26 | 1 | -147.251 | 74.975 | -23.471 | 0.364 | -86.332 |
| 26 | 2 | -141.491 | 69.218 | -19.135 | -4.856 | -75.051 |
| 27 | 1 | -78.172 | 4.818 | 45.871 | -45.024 | -5.696 |
| 27 | 2 | -28.911 | -16.794 | 151.331 | -73.355 | 8.356 |
| 28 | 1 | -124.047 | 46.189 | -38.780 | -38.362 | -38.274 |
| 28 | 2 | -119.097 | 50.102 | -24.045 | -22.355 | -50.590 |
| 29 | 1 | 9.327 | -66.800 | 142.238 | -81.698 | -2.864 |
| 29 | 2 | -70.168 | -14.132 | 62.176 | -54.114 | 13.306 |
| 30 | 1 | -92.142 | 21.689 | 34.538 | -40.276 | -14.434 |
| 30 | 2 | -73.161 | 9.326 | 53.108 | -53.059 | 8.947 |
| 31 | 1 | -82.328 | 10.929 | -6.725 | -46.317 | -16.727 |
| 31 | 2 | -89.250 | 18.663 | 23.170 | -52.821 | -9.124 |
| 32 | 1 | 214.650 | 25.723 | 71.273 | -61.795 | 150.553 |
| 32 | 2 | 23.993 | 60.437 | -22.680 | -38.251 | 39.167 |
| 33 | 1 | 210.595 | 38.524 | 37.665 | -95.536 | 78.092 |
| 33 | 2 | -6.193 | 54.423 | -30.570 | -36.094 | 24.725 |
| 34 | 1 | -92.661 | -35.004 | 55.069 | 29.935 | -7.524 |
| 34 | 2 | -97.852 | -26.591 | 51.093 | 33.315 | -10.961 |
| 35 | 1 | -22.527 | 0.518 | 107.220 | -80.039 | 18.965 |
| 35 | 2 | -41.126 | -0.989 | 114.815 | -69.010 | 15.094 |
| 36 | 1 | 169.059 | 191.781 | -234.897 | 44.145 | -128.695 |
| 36 | 2 | 363.208 | 177.427 | -58.292 | -187.519 | 93.809 |
| 37 | 1 | -50.179 | 108.646 | -74.905 | -5.299 | -34.993 |
| 37 | 2 | -39.706 | 95.957 | -59.490 | -13.056 | -22.055 |
| 38 | 1 | -68.026 | -19.006 | 55.804 | -57.344 | 9.887 |
| 38 | 2 | -61.008 | -32.063 | 59.975 | -51.277 | 1.474 |
| 39 | 1 | 53.999 | 63.996 | -45.969 | -38.741 | 51.630 |
| 39 | 2 | 41.593 | 107.103 | -105.601 | -16.784 | 10.628 |
| 40 | 1 | 81.322 | 104.766 | -22.376 | -31.718 | -0.274 |
| 40 | 2 | -28.819 | 80.589 | -54.073 | -34.004 | 6.434 |
| 41 | 1 | -85.284 | 9.347 | 29.207 | -53.109 | 0.161 |
| 41 | 2 | -78.453 | -0.797 | 40.579 | -53.550 | 5.918 |
| 42 | 1 | 276.967 | 27.655 | 31.462 | 200.808 | 50.540 |
| 42 | 2 | 204.661 | 63.264 | -18.555 | 186.071 | -1.733 |
| 43 | 1 | -32.308 | -86.708 | 74.201 | 66.734 | -40.141 |
| 43 | 2 | -54.093 | -38.763 | 145.406 | 58.872 | -6.635 |
| 44 | 1 | 135.583 | 59.201 | -12.848 | -49.936 | 66.151 |
| 44 | 2 | 128.742 | 74.550 | 38.442 | -82.824 | 38.007 |
| 45 | 1 | 317.901 | 14.686 | -91.588 | -45.924 | 66.062 |
| 45 | 2 | 343.479 | 49.940 | 92.406 | -147.319 | 138.398 |
| 46 | 1 | -10.272 | 66.030 | -40.455 | -41.395 | 28.982 |
| 46 | 2 | 119.973 | 41.400 | -74.981 | -45.268 | 65.126 |
| 47 | 1 | -87.146 | 20.275 | 1.389 | -53.365 | -6.938 |
| 47 | 2 | -90.586 | 26.965 | 8.325 | -48.816 | -12.794 |
| 48 | 1 | -131.922 | 14.536 | 12.681 | 60.631 | -67.412 |
| 48 | 2 | -117.274 | -4.207 | 37.779 | 54.711 | -44.941 |
| 49 | 1 | -46.971 | -4.679 | 97.978 | -64.834 | 12.735 |
| 49 | 2 | -55.609 | -9.991 | 94.213 | -61.054 | 15.139 |
| 50 | 1 | -63.862 | -51.531 | -101.238 | -22.878 | 43.110 |
| 50 | 2 | -59.184 | -65.771 | -101.652 | 3.300 | 8.422 |
| 51 | 1 | -23.685 | -160.111 | -111.556 | 10.163 | -0.842 |
| 51 | 2 | 130.394 | -797.981 | -69.812 | 82.805 | -38.194 |
| 52 | 1 | 13.779 | -204.959 | -195.292 | 11.208 | 0.899 |
| 52 | 2 | -55.557 | -54.075 | -140.291 | -10.774 | 25.237 |
| 53 | 1 | -35.587 | -16.033 | -95.070 | -143.939 | 91.225 |
| 53 | 2 | -68.173 | 5.872 | -117.593 | -121.630 | 49.307 |
| 54 | 1 | -59.862 | -10.876 | -106.850 | -112.806 | 30.572 |
| 54 | 2 | 51.125 | -180.545 | -183.985 | -204.098 | 39.484 |
| 55 | 1 | -75.487 | -18.088 | -56.100 | -93.561 | 10.853 |
| 55 | 2 | -77.450 | -17.595 | -38.399 | -92.413 | 31.182 |
| 56 | 1 | -81.392 | -65.904 | -153.622 | 44.984 | -60.836 |
| 56 | 2 | -40.654 | -150.035 | -185.173 | 41.662 | -63.658 |
| 57 | 1 | 24.465 | -273.277 | -183.367 | 28.674 | 1.190 |
| 57 | 2 | -72.270 | -59.742 | -132.196 | 8.304 | 2.187 |
| 58 | 1 | -50.238 | -24.592 | -30.878 | -125.371 | 79.415 |
| 58 | 2 | -24.662 | -62.110 | -105.318 | -126.643 | 61.405 |
| 59 | 1 | -38.695 | -42.194 | -97.394 | -116.407 | 48.537 |
| 59 | 2 | -63.506 | -6.847 | -147.493 | -108.125 | 25.512 |
| 60 | 1 | -70.974 | 10.531 | -68.016 | -100.931 | 47.401 |
| 60 | 2 | -53.393 | -22.493 | -56.347 | -123.849 | 70.718 |

**Table S2**. The top five components from ReFACTor method on diastolic blood pressure

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Family\_ID** | **Intra-pair** | **PC1** | **PC2** | **PC3** | **PC4** | **PC5** |
| 1 | 1 | -122.622 | 47.104 | -45.646 | 35.603 | -47.288 |
| 1 | 2 | -95.871 | 34.175 | -65.405 | 16.723 | -22.341 |
| 2 | 1 | 238.107 | 109.260 | 77.754 | 9.951 | -111.462 |
| 2 | 2 | 602.306 | -17.733 | -92.706 | -449.356 | -664.795 |
| 3 | 1 | -39.108 | 0.111 | -83.910 | -22.754 | 64.592 |
| 3 | 2 | 109.160 | 38.035 | -405.490 | -89.236 | 290.085 |
| 4 | 1 | 247.141 | 18.217 | -29.400 | 195.329 | 73.797 |
| 4 | 2 | 203.023 | 4.023 | 27.633 | 176.184 | 28.419 |
| 5 | 1 | 217.068 | 51.113 | -5.439 | 109.338 | 76.320 |
| 5 | 2 | 41.848 | 28.673 | 55.319 | 75.481 | 29.249 |
| 6 | 1 | -106.106 | 44.796 | -41.793 | 21.779 | -19.772 |
| 6 | 2 | 5.065 | 105.003 | -308.615 | -35.740 | 95.932 |
| 7 | 1 | 17.529 | 52.595 | 38.744 | 86.363 | -13.318 |
| 7 | 2 | 265.887 | 11.700 | 2.963 | 191.928 | -29.916 |
| 8 | 1 | 12.894 | 45.080 | 51.743 | 92.202 | -16.705 |
| 8 | 2 | -24.584 | 66.502 | 67.495 | 125.853 | -72.550 |
| 9 | 1 | 301.443 | 77.725 | 22.604 | -18.019 | 143.674 |
| 9 | 2 | 411.391 | -28.402 | 39.777 | 7.133 | 120.457 |
| 10 | 1 | 6.201 | 106.977 | -343.268 | 5.709 | 71.758 |
| 10 | 2 | -96.795 | 41.702 | -86.472 | 22.528 | -23.363 |
| 11 | 1 | 26.064 | 35.084 | 36.258 | 83.312 | -5.580 |
| 11 | 2 | -26.043 | 36.318 | 38.094 | 67.932 | -24.330 |
| 12 | 1 | -106.529 | 35.881 | -51.796 | 27.954 | -38.685 |
| 12 | 2 | -119.628 | 42.561 | -51.777 | 34.055 | -54.206 |
| 13 | 1 | -109.825 | 36.943 | -49.812 | 33.871 | -40.799 |
| 13 | 2 | -73.077 | 68.935 | -130.813 | 30.252 | -40.769 |
| 14 | 1 | 98.948 | 82.262 | -9.897 | 259.287 | -118.438 |
| 14 | 2 | -80.104 | 70.472 | 60.668 | 111.012 | -89.916 |
| 15 | 1 | -56.213 | 18.036 | -31.926 | -63.689 | 33.585 |
| 15 | 2 | -85.853 | 78.847 | -35.873 | -56.994 | -49.240 |
| 16 | 1 | -112.517 | 22.171 | -60.490 | 27.845 | -43.743 |
| 16 | 2 | -41.104 | 21.130 | -166.609 | 38.537 | -45.232 |
| 17 | 1 | -46.396 | 44.877 | 34.956 | 76.916 | -40.315 |
| 17 | 2 | 48.532 | 51.114 | 28.518 | 104.470 | -20.220 |
| 18 | 1 | -90.145 | 53.648 | -93.823 | 45.002 | -64.730 |
| 18 | 2 | -105.731 | 31.361 | -48.581 | 24.338 | -35.370 |
| 19 | 1 | -24.865 | 44.602 | -162.327 | -1.588 | 19.018 |
| 19 | 2 | -137.311 | 40.543 | -27.227 | 35.605 | -69.914 |
| 20 | 1 | -151.637 | 50.865 | -32.550 | 46.265 | -87.427 |
| 20 | 2 | -61.567 | 29.362 | -99.341 | 10.890 | -13.500 |
| 21 | 1 | 1.988 | 89.621 | 32.821 | 135.534 | -74.609 |
| 21 | 2 | -73.537 | 57.033 | 69.474 | 93.295 | -67.455 |
| 22 | 1 | -37.093 | 7.077 | -35.927 | -98.668 | 54.759 |
| 22 | 2 | 23.648 | 50.999 | -125.726 | -156.157 | 76.795 |
| 23 | 1 | -152.259 | 57.689 | 18.364 | -5.330 | -92.979 |
| 23 | 2 | -144.996 | 54.209 | 17.798 | -10.206 | -80.406 |
| 24 | 1 | -68.594 | 22.467 | -26.510 | -59.157 | 0.106 |
| 24 | 2 | -9.800 | 46.975 | -115.018 | -122.459 | 34.998 |
| 25 | 1 | -127.447 | 20.978 | 41.726 | -32.095 | -41.765 |
| 25 | 2 | -121.556 | 32.024 | 26.168 | -21.811 | -54.520 |
| 26 | 1 | -85.428 | 31.607 | -16.139 | -53.006 | -9.485 |
| 26 | 2 | -62.656 | 26.823 | -25.944 | -68.609 | 17.959 |
| 27 | 1 | -79.322 | 1.165 | 14.014 | -47.469 | -14.351 |
| 27 | 2 | -82.462 | 21.345 | -5.083 | -60.064 | -4.205 |
| 28 | 1 | 237.723 | 56.401 | 13.233 | -48.653 | 162.956 |
| 28 | 2 | 29.944 | 45.148 | 70.854 | -13.844 | 30.984 |
| 29 | 1 | 231.177 | 47.786 | 46.358 | -74.049 | 87.142 |
| 29 | 2 | -1.701 | 36.110 | 71.672 | -13.582 | 17.242 |
| 30 | 1 | -83.662 | 3.087 | -72.474 | 4.354 | -9.479 |
| 30 | 2 | -89.456 | 9.251 | -67.527 | 9.156 | -14.516 |
| 31 | 1 | -9.182 | 39.437 | -72.867 | -113.945 | 43.414 |
| 31 | 2 | -26.153 | 43.880 | -83.765 | -106.114 | 38.640 |
| 32 | 1 | -55.140 | 68.729 | 103.885 | 23.415 | -52.702 |
| 32 | 2 | -42.862 | 62.661 | 90.505 | 11.674 | -35.818 |
| 33 | 1 | -55.888 | 2.794 | -35.588 | -74.508 | 18.959 |
| 33 | 2 | -47.726 | -6.669 | -47.835 | -72.833 | 13.336 |
| 34 | 1 | 58.705 | 37.669 | 98.266 | -1.817 | 40.013 |
| 34 | 2 | 37.193 | 51.127 | 146.137 | 34.419 | -10.202 |
| 35 | 1 | 84.373 | 86.124 | 79.365 | -10.168 | -3.265 |
| 35 | 2 | -29.769 | 47.595 | 96.244 | -8.161 | -3.521 |
| 36 | 1 | -78.610 | 15.685 | -8.017 | -64.002 | 7.211 |
| 36 | 2 | -69.266 | 12.261 | -20.400 | -66.868 | 14.041 |
| 37 | 1 | 296.261 | 79.454 | -40.359 | 233.279 | 16.025 |
| 37 | 2 | 214.249 | 90.923 | 5.843 | 227.696 | -43.998 |
| 38 | 1 | -23.433 | -31.307 | -131.451 | 24.392 | -35.796 |
| 38 | 2 | -40.826 | 44.089 | -158.945 | 1.020 | 0.370 |
| 39 | 1 | 144.856 | 47.816 | 73.808 | -25.969 | 68.569 |
| 39 | 2 | 141.903 | 80.755 | 46.906 | -68.099 | 40.120 |
| 40 | 1 | -6.454 | 26.383 | 33.585 | 50.358 | 21.166 |
| 40 | 2 | 1.486 | 24.763 | 34.885 | 54.317 | 22.749 |
| 41 | 1 | 337.401 | -23.724 | 117.638 | 30.111 | 54.635 |
| 41 | 2 | 379.420 | 78.850 | 36.237 | -113.490 | 145.273 |
| 42 | 1 | -8.301 | 39.818 | 86.885 | -17.443 | 21.034 |
| 42 | 2 | 124.029 | 2.687 | 117.010 | -0.015 | 57.745 |
| 43 | 1 | -83.554 | 11.723 | 14.938 | -54.840 | -5.176 |
| 43 | 2 | -87.337 | 22.171 | 10.099 | -53.730 | -10.414 |
| 44 | 1 | -131.601 | 32.026 | -42.560 | 39.878 | -78.298 |
| 44 | 2 | -114.107 | 25.392 | -63.871 | 25.426 | -49.132 |
| 45 | 1 | -33.255 | 33.165 | -67.173 | -98.778 | 33.857 |
| 45 | 2 | -40.848 | 27.897 | -65.421 | -92.665 | 33.476 |
| 46 | 1 | -65.953 | -91.581 | 82.086 | 10.160 | 27.267 |
| 46 | 2 | -62.299 | -100.958 | 56.025 | 31.084 | -7.435 |
| 47 | 1 | -23.138 | -185.738 | 15.982 | 40.286 | -15.101 |
| 47 | 2 | 160.281 | -737.839 | -387.328 | 157.128 | -44.880 |
| 48 | 1 | 10.447 | -264.602 | 50.936 | 75.503 | -24.974 |
| 48 | 2 | -62.192 | -111.250 | 99.761 | 32.980 | 5.370 |
| 49 | 1 | -144.405 | -11.302 | 51.703 | 35.825 | -54.183 |
| 49 | 2 | -105.196 | -32.193 | 38.995 | 12.455 | -6.649 |
| 50 | 1 | -35.887 | -79.112 | 133.862 | -99.339 | 93.598 |
| 50 | 2 | -74.042 | -66.718 | 139.823 | -75.797 | 46.443 |
| 51 | 1 | -62.439 | -72.649 | 120.090 | -73.460 | 29.122 |
| 51 | 2 | 54.170 | -265.289 | 123.013 | -143.446 | 52.223 |
| 52 | 1 | -72.828 | -52.113 | 67.568 | -75.710 | 15.011 |
| 52 | 2 | -72.590 | -43.532 | 59.602 | -76.856 | 34.301 |
| 53 | 1 | -91.536 | -115.386 | 66.622 | 78.267 | -86.455 |
| 53 | 2 | -49.931 | -205.223 | 48.779 | 87.738 | -88.802 |
| 54 | 1 | 26.660 | -310.255 | 14.807 | 90.861 | -28.756 |
| 54 | 2 | -77.933 | -106.410 | 83.393 | 46.331 | -20.836 |
| 55 | 1 | 11.836 | -145.218 | 104.024 | -127.387 | 131.889 |
| 55 | 2 | -46.955 | -71.173 | 91.892 | -97.653 | 76.801 |
| 56 | 1 | -42.669 | -51.936 | 72.339 | -102.192 | 85.189 |
| 56 | 2 | -23.872 | -121.264 | 109.830 | -86.647 | 64.334 |
| 57 | 1 | -38.492 | -98.107 | 104.158 | -78.419 | 50.633 |
| 57 | 2 | -70.980 | -87.120 | 149.076 | -55.423 | 18.645 |
| 58 | 1 | -70.695 | -34.750 | 102.071 | -73.147 | 48.012 |
| 58 | 2 | -48.415 | -61.921 | 93.235 | -95.136 | 74.793 |

**Table S3**. The top 20 CpGs in genome-wide DNA methylation analysis on BMI

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Chromosome** | **Position (bp)** | ***β*** | ***P*-value** | **FDR** | **HGNC symbol** |
| ***BMI-SBP*** |  |  |  |  |  |
| chr5 | 110,560,719 | -0.738 | 1.61E-07 | 2.54E-02 | *CAMK4* |
| chr10 | 50,976,750 | 0.047 | 2.93E-07 | 2.54E-02 | *OGDHL* |
| chr10 | 50,976,733 | 0.044 | 3.77E-07 | 2.54E-02 | *OGDHL* |
| chr10 | 50,976,753 | 0.047 | 4.87E-07 | 2.54E-02 | *OGDHL* |
| chr10 | 50,976,719 | 0.042 | 5.11E-07 | 2.54E-02 | *OGDHL* |
| chr11 | 2,813,238 | 0.091 | 1.58E-06 | 6.13E-02 | *KCNQ1* |
| chr10 | 50,976,711 | 0.039 | 1.72E-06 | 6.13E-02 | *OGDHL* |
| chr11 | 2,813,244 | 0.089 | 2.03E-06 | 6.31E-02 | *KCNQ1* |
| chr11 | 2,813,251 | 0.088 | 2.33E-06 | 6.44E-02 | *KCNQ1* |
| chr1 | 45,280,311 | 0.459 | 3.82E-06 | 8.89E-02 | *BTBD19* |
| chr3 | 62,358,242 | -0.431 | 4.03E-06 | 8.89E-02 | *FEZF2* |
| chr3 | 62,358,238 | -0.432 | 4.37E-06 | 8.89E-02 | *FEZF2* |
| chr3 | 62,358,235 | -0.433 | 4.69E-06 | 8.89E-02 | *FEZF2* |
| chr3 | 62,358,232 | -0.433 | 5.04E-06 | 8.89E-02 | *FEZF2* |
| chr10 | 50,976,764 | 0.049 | 5.37E-06 | 8.89E-02 | *OGDHL* |
| chr3 | 62,358,226 | -0.434 | 5.75E-06 | 8.93E-02 | *FEZF2* |
| chr3 | 62,358,223 | -0.434 | 6.27E-06 | 9.17E-02 | *FEZF2* |
| chr3 | 62,358,220 | -0.434 | 7.12E-06 | 9.84E-02 | *FEZF2* |
| chr3 | 62,358,217 | -0.434 | 7.62E-06 | 9.97E-02 | *FEZF2* |
| chr1 | 179,334,431 | -0.079 | 8.42E-06 | 1.04E-01 | *AXDND1* |
| ***BMI-DBP*** |  |  |  |  |  |
| chr10 | 50,976,753 | 0.059 | 9.93E-09 | 1.41E-03 | *OGDHL* |
| chr10 | 50,976,750 | 0.058 | 1.29E-08 | 1.41E-03 | *OGDHL* |
| chr10 | 50,976,764 | 0.062 | 1.86E-08 | 1.41E-03 | *OGDHL* |
| chr19 | 7,543,295 | -0.093 | 2.26E-08 | 1.41E-03 | *PEX11G* |
| chr10 | 50,976,768 | 0.063 | 2.88E-08 | 1.44E-03 | *OGDHL* |
| chr10 | 50,976,781 | 0.067 | 1.35E-07 | 5.62E-03 | *OGDHL* |
| chr10 | 50,976,783 | 0.068 | 1.75E-07 | 6.24E-03 | *OGDHL* |
| chr10 | 50,976,733 | 0.053 | 2.33E-07 | 6.35E-03 | *OGDHL* |
| chr10 | 50,976,785 | 0.069 | 2.35E-07 | 6.35E-03 | *OGDHL* |
| chr19 | 46,307,735 | -0.053 | 2.55E-07 | 6.35E-03 | *RSPH6A* |
| chr19 | 46,307,742 | -0.053 | 4.79E-07 | 1.08E-02 | *RSPH6A* |
| chr10 | 50,976,719 | 0.051 | 6.54E-07 | 1.36E-02 | *OGDHL* |
| chr19 | 46,307,719 | -0.050 | 7.44E-07 | 1.43E-02 | *RSPH6A* |
| chr9 | 137,240,420 | -0.057 | 1.06E-06 | 1.88E-02 | *RXRA* |
| chr9 | 137,240,415 | -0.055 | 1.86E-06 | 2.90E-02 | *RXRA* |
| chr19 | 646,099 | -0.042 | 1.93E-06 | 2.90E-02 | *RNF126* |
| chr9 | 134,703,710 | 0.298 | 2.15E-06 | 2.90E-02 | *MED27* |
| chr4 | 147,558,468 | 0.049 | 2.16E-06 | 2.90E-02 | *POU4F2* |
| chr10 | 50,976,711 | 0.048 | 2.32E-06 | 2.90E-02 | *OGDHL* |
| chr19 | 30,016,040 | 0.074 | 2.33E-06 | 2.90E-02 | *OGDHL* |

**Note**: *β*, regression coefficient; DBP, diastolic blood pressure; SBP, systolic blood pressure

**Table S4**. The CpGs significantly associated with blood pressure levels (*P* < 0.05)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Chromosome** | **Position (bp)** | ***β*** | ***P*-value** | **HGNC symbol** |
| ***BMI-SBP*** |  |  |  |  |
| chr10 | 50,489,592 | 5.223 | 5.96E-03 | *C10orf71-AS1* |
| chr4 | 181,361,733 | 5.022 | 7.06E-03 | *NDUFB5P1* |
| chr12 | 52,533,118 | -6.682 | 1.57E-02 | *KRT80* |
| chr1 | 32,196,570 | 0.954 | 1.68E-02 | *BAI2* |
| chr9 | 139,902,785 | 4.021 | 1.72E-02 | *ABCA2* |
| chr19 | 7,543,295 | 3.419 | 2.22E-02 | *PEX11G* |
| chr9 | 139,902,796 | 5.488 | 2.31E-02 | *ABCA2* |
| chr9 | 139,902,798 | 5.821 | 2.75E-02 | *ABCA2* |
| chr11 | 69,589,717 | -4.477 | 4.78E-02 | *FGF4* |
| ***BMI-DBP*** |  |  |  |  |
| chr19 | 2,434,321 | 2.089 | 4.51E-05 | *LMNB2* |
| chr19 | 5,070,737 | 3.520 | 1.15E-04 | *KDM4B* |
| chr10 | 50,489,592 | 3.528 | 2.31E-04 | *C10orf71-AS1* |
| chr19 | 5,070,724 | 3.626 | 2.99E-04 | *KDM4B* |
| chr16 | 3,706,626 | 2.475 | 1.52E-03 | *DNASE1/TRAP1* |
| chr2 | 122,014,456 | 2.439 | 2.31E-03 | *TFCP2L1* |
| chr17 | 73,279,760 | 7.111 | 4.05E-03 | *SLC25A19* |
| chr17 | 73,279,753 | 7.070 | 7.58E-03 | *SLC25A19* |
| chr9 | 133,300,271 | 3.001 | 7.96E-03 | *HMCN2* |
| chr19 | 46,307,742 | 3.706 | 9.82E-03 | *RSPH6A* |
| chr19 | 46,307,735 | 3.531 | 1.19E-02 | *RSPH6A* |
| chr7 | 158,217,257 | -0.773 | 1.43E-02 | *PTPRN2* |
| chr9 | 140,410,009 | 2.240 | 1.56E-02 | *PNPLA7* |
| chr19 | 10,668,281 | 1.488 | 1.62E-02 | *KRI1* |
| chr17 | 15,821,433 | -3.680 | 1.85E-02 | *ADORA2B* |
| chr16 | 3,534,976 | 0.841 | 2.19E-02 | *NAA60* |
| chr19 | 46,307,719 | 3.116 | 2.23E-02 | *RSPH6A* |
| chr16 | 3,534,973 | 0.823 | 2.44E-02 | *NAA60* |
| chr17 | 15,821,408 | -3.238 | 2.78E-02 | *ADORA2B* |
| chr1 | 47,780,754 | 2.349 | 3.14E-02 | *STIL* |
| chr1 | 9,898,437 | 2.444 | 3.22E-02 | *CTNNBIP1* |
| chr1 | 9,898,443 | 2.560 | 3.68E-02 | *CTNNBIP1* |
| chr1 | 9,898,432 | 2.311 | 3.86E-02 | *CTNNBIP1* |
| chr17 | 15,847,837 | 3.133 | 4.10E-02 | *ADORA2B* |
| chr9 | 139,902,796 | 2.622 | 4.19E-02 | *ABCA2* |
| chr19 | 46,307,704 | 3.023 | 4.28E-02 | *RSPH6A* |
| chr17 | 15,847,841 | 2.952 | 4.34E-02 | *ADORA2B* |
| chr13 | 112,830,390 | 2.212 | 4.35E-02 | *LINC01070* |
| chr9 | 139,902,785 | 1.931 | 4.41E-02 | *ABCA2* |
| chr14 | 104,662,403 | -2.725 | 4.59E-02 | *KIF26A* |
| chr8 | 10,897,486 | 0.755 | 4.68E-02 | *XKR6* |
| chr9 | 139,902,798 | 2.764 | 4.76E-02 | *ABCA2* |
| chr1 | 47,780,765 | 2.041 | 4.80E-02 | *STIL* |

**Note**: *β*, regression coefficient; DBP, diastolic blood pressure; SBP, systolic blood pressure

**Table S5**. BMI mediators for the association between DNA methylation and blood pressure

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CpGs Annotation** | | | |  | **Direct Effects** | |  | **Average Mediated Effects of BMI** | | Absolute value of ratio of indirect effect to direct effect |
| CpGs No. | Chromosome | Position (bp) | Gene symbol |  | *β* | 95% CI |  | *β* | 95% CI |
| **DNAm→BMI→SBP** |  |  |  |  |  |  |  |  |  |  |
| CpG1 | chr9 | 139,902,785 | *ABCA2* |  | 3.9350 | (0.2736, 7.5965) |  | -1.6748 | (-3.6883, -0.2662) | 42.56% |
| CpG2 | chr9 | 139,902,796 | *ABCA2* |  | 4.7905 | (0.0269, 9.5541) |  | -2.3493 | (-4.9707, -0.4547) | 49.04% |
| **DNAm→BMI→DBP** |  |  |  |  |  |  |  |  |  |  |
| CpG1 | chr19 | 2,434,321 | *LMNB2* |  | 1.6514 | (0.5136, 2.7893) |  | -0.3485 | (-0.7552, -0.025) | 21.10% |
| CpG2 | chr19 | 5,070,737 | *KDM4B* |  | 2.6892 | (0.8229, 4.5554) |  | -0.5484 | (-1.2248, -0.033) | 20.39% |
| CpG3 | chr10 | 50,489,592 | *C10orf71-AS1* |  | 4.0362 | (1.8409, 6.2314) |  | -0.7251 | (-1.6013, -0.0821) | 17.96% |
| CpG4 | chr19 | 5,070,724 | *KDM4B* |  | 2.9280 | (0.7747, 5.0814) |  | -0.6491 | (-1.3779, -0.0605) | 22.17% |
| CpG5 | chr16 | 3,706,626 | *DNASE1* |  | 2.5188 | (1.0885, 3.949) |  | -0.5413 | (-1.125, -0.0489) | 21.49% |
| CpG6 | chr2 | 122,014,456 | *TFCP2L1* |  | 3.0793 | (1.1388, 5.0197) |  | -0.5734 | (-1.2489, -0.0365) | 18.62% |
| CpG10 | chr9 | 139,902,796 | *ABCA2* |  | 3.5924 | (0.8704, 6.3145) |  | -0.9025 | (-2.1116, -0.046) | 25.12% |
| CpG11 | chr9 | 139,902,785 | *ABCA2* |  | 2.8590 | (0.7513, 4.9667) |  | -0.6813 | (-1.6292, -0.0328) | 23.83% |
| CpG12 | chr9 | 139,902,798 | *ABCA2* |  | 3.6557 | (0.7397, 6.5716) |  | -0.9111 | (-2.0862, -0.0286) | 24.92% |

**Note**: DBP, diastolic blood pressure; SBP, systolic blood pressure; *β*, regression coefficient

\* Given that the direct effects and mediated effects showed the opposite direction, the absolute value of ratio of indirect effect to total effect was calculated.

**Table S6**. DNA methylation mediators for the association of BMI and blood pressure in parallel mediation model in males and females

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CpGs No.** | **Chromosome** | **Position** | **Gene symbol** | **Direct Effects** | |  | **Average/Total Mediated Effects of DNAm** | | Absolute values of ratio of indirect effect to direct effect\* |
| *β* | 95% CI |  | *β* | 95% CI |
| ***Male*** |  |  |  |  |  |  |  |  |  |
| **BMI→DNAm→SBP**  (n = 32 pairs) |  |  |  |  |  |  |  |  |  |
| CpG1 | chr5 | 43,007,111 | *ENSG00000271788* | 2.1254 | (0.6712, 3.5797) |  | -0.8071 | (-1.8512, -0.1570) | 37.97% |
| CpG2 | chr19 | 56,090,948 | *ZNF579* | 2.1818 | (0.7703, 3.5933) |  | -0.8635 | (-1.6767, -0.2861) | 39.58% |
| CpG3 | chr19 | 56,090,936 | *ZNF579* | 2.2713 | (0.8501, 3.6926) |  | -0.9530 | (-1.7642, -0.3432) | 41.96% |
| CpG4 | chr19 | 56,090,942 | *ZNF579* | 2.2047 | (0.7877, 3.6217) |  | -0.8864 | (-1.7219, -0.3076) | 40.21% |
| CpG5 | chr5 | 43,007,082 | *ENSG00000271788* | 2.0114 | (0.4802, 3.5426) |  | -0.6930 | (-1.9221, -0.0072) | 34.45% |
| CpG6 | chr5 | 43,007,142 | *ENSG00000271788* | 2.0860 | (0.6813, 3.4906) |  | -0.7676 | (-1.6614, -0.1808) | 36.80% |
| CpG7 | chr5 | 43,007,156 | *ENSG00000271788* | 2.0480 | (0.6739, 3.4221) |  | -0.7297 | (-1.6075, -0.1654) | 35.63% |
| CpG8 | chr19 | 56,090,930 | *ZNF579* | 2.2967 | (0.8686, 3.7248) |  | -0.9784 | (-1.8306, -0.3260) | 42.60% |
| CpG9 | chr19 | 56,090,924 | *ZNF579* | 2.2927 | (0.8601, 3.7254) |  | -0.9744 | (-1.8292, -0.3096) | 42.50% |
| CpG10 | chr6 | 1,377,611 | *FOXQ1* | 1.8440 | (0.4028, 3.2852) |  | -0.5256 | (-1.3824, -0.0330) | 28.50% |
| *Parallel mediation model*# |  |  |  | 3.4936 | (1.9971, 4.9900) |  | -2.1752 | (-3.9863, -1.0700) | 62.26% |
| **BMI→DNAm→DBP**  (n = 28 pairs) |  |  |  |  |  |  |  |  |  |
| CpG1 | chr19 | 19,479,570 | *MAU2* | 0.1182 | (0.0535, 0.1829) |  | -0.0423 | (-0.0898, -0.0063) | 35.79% |
| CpG2 | chr19 | 19,479,581 | *MAU2* | 0.1129 | (0.0464, 0.1794) |  | -0.0370 | (-0.0798, -0.0053) | 32.77% |
| CpG3 | chr17 | 4,810,720 | *CHRNE* | 0.0979 | (0.0286, 0.1671) |  | -0.0219 | (-0.0561, 0.0033) | 22.37% |
| CpG4 | chr19 | 19,479,537 | *MAU2* | 0.1150 | (0.0512, 0.1787) |  | -0.0390 | (-0.0896, -0.0015) | 33.91% |
| CpG5 | chr19 | 19,479,527 | *MAU2* | 0.1126 | (0.0486, 0.1766) |  | -0.0367 | (-0.0855, 0.0012) | 32.59% |
| *Parallel mediation model* |  |  |  | 1.9102 | (1.0121, 2.8083) |  | -0.9267 | (-1.6496, -0.4238) | 48.51% |
| ***Female*** |  |  |  |  |  |  |  |  |  |
| **BMI→DNAm→SBP** (n = 28 pairs) |  |  |  |  |  |  |  |  |  |
| CpG1 | chr19 | 46,307,735 | *RSPH6A* | 2.8850 | (1.4179, 4.3520) |  | -0.8753 | (-1.6745, -0.2950) | 30.34% |
| CpG2 | chr19 | 46,307,742 | *RSPH6A* | 2.9186 | (1.4562, 4.3810) |  | -0.9089 | (-1.7491, -0.3107) | 31.14% |
| CpG3 | chr19 | 46,307,719 | *RSPH6A* | 2.7584 | (1.2591, 4.2578) |  | -0.7487 | (-1.4697, -0.1412) | 27.14% |
| CpG4 | chr4 | 8,740,381 | *CPZ* | 2.4555 | (1.0274, 3.8837) |  | -0.4458 | (-0.9742, -0.0603) | 18.16% |
| CpG5 | chr4 | 8,740,373 | *CPZ* | 2.4330 | (0.9895, 3.8766) |  | -0.4233 | (-0.9216, -0.0372) | 17.40% |
| CpG6 | chr1 | 161,122,524 | *UFC1* | 2.4791 | (1.0801, 3.8781) |  | -0.4694 | (-1.0407, -0.0263) | 18.93% |
| CpG7 | chr1 | 97,029,491 | *RN7SL831P* | 2.3802 | (0.9495, 3.8110) |  | -0.3705 | (-1.0521, -0.0217) | 15.57% |
| CpG8 | chr15 | 67,011,808 | *SMAD6* | 2.4778 | (1.0873, 3.8683) |  | -0.4681 | (-0.9727, 0.0027) | 18.89% |
| CpG9 | chr9 | 121,571,576 | *TUBB4BP6* | 2.6033 | (1.1910, 4.0157) |  | -0.5936 | (-1.2787, -0.1148) | 22.80% |
| CpG10 | chr20 | 23,015,092 | *ENSG00000234646* | 2.4868 | (1.0672, 3.9064) |  | -0.4771 | (-1.1279, -0.0654) | 19.19% |
| *Parallel mediation model*# |  |  |  | 3.6234 | (2.1136, 5.1333) |  | -1.6137 | (-3.5354, -0.1716) | 44.54% |
| **BMI→DNAm→DBP**  (n = 28 pairs) |  |  |  |  |  |  |  |  |  |
| CpG1 | chr16 | 1,392,283 | *BAIAP3* | 0.3429 | (-0.3193, 1.0052) |  | -0.3761 | (-0.7110, -0.0823) | 109.68% |
| CpG2 | chr1 | 30,301,506 | *ENSG00000222787* | -0.4474 | (-1.0882, 0.1935) |  | 0.4142 | (0.1441, 0.8089) | 92.58% |
| CpG3 | chr12 | 34,498,373 | *AK6P1* | 0.2925 | (-0.4190, 1.0041) |  | -0.3257 | (-0.6938, -0.0384) | 111.35% |
| CpG4 | chr17 | 73,279,760 | *SLC25A19* | 0.5421 | (-0.1274, 1.2115) |  | -0.5753 | (-0.9626, -0.1827) | 106.12% |
| CpG5 | chr16 | 87,552,206 | *ENSG00000260750* | 0.3828 | (-0.2757, 1.0413) |  | -0.4160 | (-0.7826, -0.0759) | 108.67% |
| CpG6 | chr2 | 131,046,171 | *RPL19P4* | 0.3309 | (-0.3528, 1.0146) |  | -0.3641 | (-0.7275, -0.0871) | 110.03% |
| CpG7 | chr2 | 131,046,161 | *RPL19P4* | 0.3241 | (-0.3567, 1.0049) |  | -0.3573 | (-0.7214, -0.0835) | 110.24% |
| CpG8 | chr2 | 131,046,184 | *RPL19P4* | 0.3359 | (-0.3539, 1.0258) |  | -0.3691 | (-0.7694, -0.0725) | 109.88% |
| CpG9 | chr2 | 131,046,140 | *RPL19P4* | 0.3012 | (-0.3714, 0.9738) |  | -0.3344 | (-0.6891, -0.0668) | 111.02% |
| CpG10 | chr2 | 131,046,151 | *RPL19P4* | 0.3138 | (-0.3637, 0.9914) |  | -0.3470 | (-0.6953, -0.0684) | 110.58% |
| *Parallel mediation model*# |  |  |  | 0.6404 | (-0.0896, 1.3704) |  | -0.6736 | (-1.3348, 0.0070) | 105.18% |

**Note**: DBP, diastolic blood pressure; SBP, systolic blood pressure; *β*, regression coefficient

\* Given that the direct effects and mediated effects showed the opposite direction, the absolute value of ratio of indirect effect to total effect was calculated.

# Given the characteristics of PROCESS macro in SPSS program, choosing 10 CpGs in the parallel mediation model on the basis of absolute value of regression coefficients