**Table S1:** Characteristics of subjects in the Taiwan Biobank (*N*=67,237) across increasing deciles of Hb levels

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** |  | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | ***P*-value for Trend** |
| **Men, *n* (%)** | 20,670 (30.7) | 1,997 (9.7) | 2,110 (10.2) | 2,250 (10.9) | 2,024 (9.8) | 2,269 (11.0) | 1,535 (7.4) | 2,192 (10.6) | 2,433 (11.8) | 1,761 (8.5) | 2,099 (10.2) |  |
| Decile range, g/dL |  | 9.0-13.5 | 13.6-14.1 | 14.2-14.5 | 14.6-14.8 | 14.9-15.1 | 15.2-15.3 | 15.4-15.6 | 15.7-16.0 | 16.1-16.4 | 16.5-20.3 |  |
| Hemoglobin, g/dL | 15.1 ± 1.2 | 12.7 ± 0.8 | 13.9 ± 0.2 | 14.4 ± 0.1 | 14.7 ± 0.1 | 15.0 ± 0.1 | 15.2 ± 0.1 | 15.5 ± 0.1 | 15.8 ± 0.1 | 16.2 ± 0.1 | 17.0 ± 0.5 | <0.0001 |
| Age, y | 50.8 ± 11.3 | 54.6 ± 11.0 | 53.0 ± 11.2 | 51.9 ± 11.3 | 51.2 ± 11.1 | 51.0 ± 11.4 | 50.0 ± 11.1 | 49.5 ± 11.3 | 49.4 ± 11.2 | 48.2 ± 11.0 | 48.8 ± 10.9 | <0.0001 |
| 30-39 | 4,493 (21.7) | 278 (13.9) | 358 (17.0) | 438 (19.5) | 402 (19.9) | 503 (22.2) | 357 (23.3) | 548 (25.0) | 602 (24.7) | 482 (27.4) | 525 (25.0) |  |
| 40-49 | 4,510 (21.8) | 320 (16.0) | 404 (19.2) | 441 (19.6) | 431 (21.3) | 454 (20.0) | 352 (22.9) | 521 (23.8) | 581 (23.9) | 444 (25.2) | 562 (26.8) |  |
| 50-59 | 5,834 (28.2) | 548 (27.4) | 565 (26.8) | 659 (29.3) | 595 (29.4) | 660 (29.1) | 449 (29.3) | 592 (27.0) | 689 (28.3) | 490 (27.8) | 587 (28.0) |  |
| 60-70 | 5,833 (28.3) | 851 (42.6) | 783 (37.1) | 712 (31.6) | 596 (29.5) | 652 (28.7) | 377 (24.6) | 531 (24.2) | 561 (23.1) | 345 (19.6) | 425 (20.3) |  |
| Weight, kg | 73.1 ± 11.8 | 69.3 ± 11.1 | 70.6 ± 11.1 | 71.5 ± 11.1 | 72.1 ± 11.3 | 72.6 ± 11.3 | 73.6 ± 11.6 | 74.0 ± 11.4 | 74.5 ± 12.1 | 75.6 ± 12.1 | 77.1 ± 12.6 | <0.0001 |
| Body mass index, kg/m2 | 25.4 ± 3.6 | 24.6 ± 3.5 | 24.7 ± 3.4 | 24.9 ± 3.3 | 25.0 ± 3.4 | 25.3 ± 3.4 | 25.5 ± 3.5 | 25.6 ± 3.4 | 25.8 ± 3.6 | 26.1 ± 3.6 | 26.7 ± 3.8 | <0.0001 |
| Waist circumference, cm | 88.2 ± 9.4 | 86.2 ± 9.6 | 86.4 ± 9.2 | 87.1 ± 9.2 | 87.1 ± 9.3 | 87.8 ± 9.0 | 88.5 ± 9.0 | 88.8 ± 9.1 | 89.1 ± 9.5 | 90.0 ± 9.2 | 91.6 ± 9.7 | <0.0001 |
| Waist-hip ratio | 0.904 ± 0.06 | 0.900 ± 0.06 | 0.896 ± 0.06 | 0.898 ± 0.06 | 0.897 ± 0.06 | 0.902 ± 0.06 | 0.904 ± 0.05 | 0.905 ± 0.06 | 0.907 ± 0.06 | 0.912 ± 0.05 | 0.923 ± 0.05 | <0.0001 |
| Systolic blood pressure, mm Hg | 126.9 ± 16.8 | 126.6 ± 16.9 | 125.5 ± 16.7 | 125.6 ± 16.5 | 126.4 ± 17.1 | 126.8 ± 16.7 | 126.7 ± 16.4 | 126.8 ± 16.3 | 126.9 ± 16.3 | 128.2 ± 17.2 | 130.2 ± 17.5 | <0.0001 |
| Diastolic blood pressure, mm Hg | 78.6 ± 10.6 | 75.4 ± 10.3 | 76.0 ± 10.1 | 76.8 ± 10.0 | 77.7 ± 10.3 | 78.3 ± 10.3 | 78.8 ± 10.2 | 79.3 ± 10.2 | 79.7 ± 10.4 | 81.0 ± 10.9 | 82.8 ± 11.2 | <0.0001 |
| Fasting blood glucose, mg/dL | 99.7 ± 24.1 | 99.8 ± 24.7 | 98.4 ± 22.8 | 99.0 ± 21.5 | 98.3 ± 20.7 | 98.4 ± 20.6 | 98.5 ± 21.4 | 98.9 ± 21.2 | 99.6 ± 23.4 | 100.8 ± 26.7 | 105.2 ± 34.1 | <0.0001 |
| Glycated hemoglobin, % | 5.91 ± 0.94 | 5.94 ± 0.96 | 5.90 ± 0.87 | 5.89 ± 0.85 | 5.87 ± 0.86 | 5.87 ± 0.83 | 5.86 ± 0.83 | 5.86 ± 0.83 | 5.89 ± 0.89 | 5.93 ± 1.02 | 6.10 ± 1.30 | 0.9639 |
| Triglycerides, mg/dL | 139.1 ± 109.2 | 115.8 ± 88.6 | 116.9 ± 77.8 | 124.4 ± 99.5 | 127.7 ± 88.0 | 131.2 ± 86.0 | 144.9 ± 123.0 | 142.0 ± 115.2 | 150.5 ± 114.0 | 160.0 ± 128.5 | 180.8 ± 142.4 | <0.0001 |
| Total cholesterol, mg/dL | 191.5 ± 34.9 | 177.2 ± 34.5 | 185.7 ± 32.7 | 188.5 ± 33.1 | 189.9 ± 35.3 | 192.1 ± 34.2 | 195.0 ± 35.1 | 194.5 ± 34.6 | 195.6 ± 34.0 | 197.3 ± 34.3 | 199.9 ± 36.0 | <0.0001 |
| LDL-cholesterol, mg/dL | 120.7 ± 31.4 | 108.1 ± 29.5 | 115.7 ± 29.1 | 117.5 ± 29.8 | 119.5 ± 31.9 | 121.6 ± 30.9 | 123.5 ± 31.4 | 124.0 ± 31.5 | 124.3 ± 31.0 | 126.5 ± 31.2 | 127.3 ± 32.6 | <0.0001 |
| HDL-cholesterol, mg/dL | 47.9 ± 11.1 | 48.3 ± 12.2 | 49.3 ± 11.6 | 49.4 ± 11.9 | 48.9 ± 11.1 | 48.4 ± 11.0 | 47.7 ± 10.9 | 47.7 ± 10.8 | 47.2 ± 10.6 | 46.2 ± 10.4 | 45.3 ± 10.0 | <0.0001 |
| Uric acid, mg/dL | 6.42 ± 1.37 | 6.29 ± 1.50 | 6.28 ± 1.33 | 6.24 ± 1.34 | 6.32 ± 1.33 | 6.42 ± 1.34 | 6.46 ± 1.34 | 6.47 ± 1.35 | 6.51 ± 1.31 | 6.57 ± 1.38 | 6.68 ± 1.42 | <0.0001 |
| Smoking status |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Never smoked | 11,112 (53.8) | 1,097 (54.9) | 1,198 (56.8) | 1,232 (54.8) | 1,123 (55.5) | 1,263 (55.7) | 834 (54.4) | 1,221 (55.8) | 1,303 (53.6) | 911 (51.8) | 925 (44.2) |  |
| Stopped smoked | 5,093 (24.6) | 561 (28.1) | 571 (27.1) | 586 (26.1) | 499 (24.7) | 575 (25.3) | 375 (24.5) | 500 (22.8) | 571 (23.5) | 382 (21.7) | 472 (22.5) |  |
| Occasionally smoking | 134 (0.7) | 14 (0.70) | 17 (0.81) | 17 (0.76) | 16 (0.79) | 19 (0.84) | 10 (0.65) | 9 (0.41) | 13 (0.53) | 11 (0.63) | 8 (0.38) |  |
| Currently smoking | 4,331 (21.0) | 325 (16.3) | 323 (15.3) | 414 (18.4) | 385 (19.0) | 412 (18.2) | 314 (20.5) | 460 (21.0) | 544 (22.4) | 456 (25.9) | 690 (32.9) |  |
| Alcohol drinking status |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Stopped drinking | 1,189 (5.8) | 152 (7.6) | 117 (5.6) | 125 (5.6) | 119 (5.9) | 127 (5.6) | 87 (5.7) | 118 (5.4) | 133 (5.5) | 89 (5.1) | 122 (5.8) |  |
| Occasionally drinking | 16,751 (81.0) | 1,633 (81.8) | 1,741 (82.6) | 1,857 (82.6) | 1,656 (81.9) | 1,857 (81.8) | 1,241 (81.0) | 1,769 (80.8) | 1,982 (81.5) | 1,396 (79.3) | 1,612 (77.0) |  |
| Currently drinking | 2,730 (13.2) | 212 (10.6) | 251 (11.9) | 267 (11.9) | 248 (12.3) | 285 (12.6) | 205 (13.4) | 303 (13.8) | 316 (13.0) | 275 (15.6) | 361 (17.2) |  |
| Physical activity |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| With regular exercise | 8,949 (43.3) | 1,011 (50.7) | 1,058 (50.2) | 1,057 (47.0) | 902 (44.6) | 982 (43.3) | 622 (40.7) | 865 (39.5) | 989 (40.7) | 690 (39.2) | 769 (36.7) |  |
| Highest educational attainment |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| No formal teaching or up to primary education | 691 (3.3) | 124 (6.2) | 87 (4.1) | 84 (3.7) | 72 (3.6) | 61 (2.7) | 42 (2.7) | 56 (2.6) | 69 (2.8) | 44 (2.5) | 55 (2.6) |  |
| Secondary education to high school | 6,546 (31.7) | 712 (35.3) | 622 (29.5) | 690 (30.7) | 619 (30.6) | 721 (31.8) | 482 (31.4) | 641 (29.3) | 781 (32.1) | 553 (31.4) | 727 (34.7) |  |
| University to post-graduate studies | 13,430 (65.0) | 1,181 (58.6) | 1,399 (66.4) | 1,475 (65.6) | 1,331 (65.8) | 1,486 (65.5) | 1,009 (65.8) | 1,493 (68.2) | 1,581 (65.0) | 1,163 (66.1) | 1,313 (62.7) |  |
| **Women, *n* (%)** | 46,567 (69.3) | 4,801 (10.3) | 4,043 (8.7) | 4,464 (9.6) | 4,558 (9.8) | 5,211 (11.2) | 5,698 (12.2) | 3,368 (7.2) | 4,650 (10.0) | 5,534 (11.9) | 4,240 (9.1) |  |
| Decile range, g/dL |  | 6.6-11.5 | 11.6-12.1 | 12.2-12.5 | 12.6-12.8 | 12.9-13.1 | 13.2-13.4 | 13.5-13.6 | 13.7-13.9 | 14.0-14.4 | 14.5-18.7 |  |
| Hemoglobin, g/dL | 13.0 ± 1.3 | 10.4 ± 1.1 | 11.9 ± 0.2 | 12.4 ± 0.1 | 12.7 ± 0.1 | 13.0 ± 0.1 | 13.3 ± 0.1 | 13.6 ± 0.1 | 13.8 ± 0.1 | 14.2 ± 0.1 | 14.9 ± 0.4 | <0.0001 |
| Age, y | 50.3 ± 10.5 | 45.7 ± 9.4 | 48.3 ± 10.6 | 49.4 ± 10.6 | 50.0 ± 10.8 | 50.5 ± 10.7 | 51.0 ± 10.4 | 51.1 ± 10.5 | 51.9 ± 10.2 | 52.1 ± 10.1 | 53.1 ± 9.5 | <0.0001 |
| 30-39 | 9,376 (20.1) | 1,379 (28.7) | 1,049 (26.0) | 1,023 (22.9) | 1,010 (22.2) | 1,094 (21.0) | 1,046 (18.4) | 630 (18.7) | 771 (16.6) | 859 (15.5) | 515 (12.1) |  |
| 40-49 | 10,750 (23.1) | 1,941 (40.4) | 1,109 (27.4) | 1,098 (24.6) | 1,015 (22.3) | 1,064 (20.4) | 1,207 (21.2) | 694 (20.6) | 858 (18.5) | 1,048 (18.9) | 716 (16.9) |  |
| 50-59 | 15,930 (34.2) | 945 (19.7) | 1,143 (28.3) | 1,414 (31.7) | 1,490 (32.7) | 1,816 (34.9) | 2,106 (37.0) | 1,207 (35.8) | 1,798 (38.7) | 2,170 (39.2) | 1,842 (43.4) |  |
| 60-70 | 10,511 (22.6) | 536 (11.2) | 742 (18.4) | 929 (20.8) | 1,043 (22.9) | 1,237 (23.7) | 1,339 (23.5) | 837 (24.9) | 1,223 (26.3) | 1,457 (26.3) | 1,168 (27.5) |  |
| Had menopause | 23,907 (51.3) | 1,089 (22.5) | 1,640 (40.6) | 2,114 (47.4) | 2,300 (50.5) | 2,799 (53.7) | 3,168 (55.6) | 1,874 (55.7) | 2,781 (59.8) | 3,385 (61.2) | 2,757 (65.0) | <0.0001 |
| Age at menopause | 49.4 ± 5.0 | 49.3 ± 4.7 | 49.4 ± 5.1 | 49.4 ± 5.0 | 49.3 ± 5.0 | 49.3 ± 5.1 | 49.4 ± 4.8 | 49.3 ± 5.2 | 49.5 ± 5.0 | 49.6 ± 4.9 | 49.5 ± 5.0 | 0.0929 |
| Weight, kg | 58.6 ± 9.9 | 58.3 ± 9.9 | 57.5 ± 9.6 | 57.4 ± 9.4 | 57.6 ± 9.5 | 57.6 ± 9.3 | 58.4 ± 9.8 | 58.9 ± 9.9 | 58.9 ± 10.0 | 59.8 ± 10.1 | 61.2 ± 10.7 | <0.0001 |
| Body mass index, kg/m2 | 23.6 ± 3.8 | 23.2 ± 3.7 | 23.1 ± 3.7 | 23.1 ± 3.5 | 23.2 ± 3.5 | 23.3 ± 3.5 | 23.6 ± 3.7 | 23.8 ± 3.7 | 23.9 ± 3.8 | 24.2 ± 3.9 | 24.9 ± 4.1 | <0.0001 |
| Waist circumference, cm | 80.9 ± 9.7 | 79.5 ± 9.5 | 79.4 ± 9.6 | 79.4 ± 9.3 | 79.7 ± 9.3 | 80.1 ± 9.2 | 80.9 ± 9.5 | 81.4 ± 9.5 | 81.5 ± 9.8 | 82.5 ± 9.9 | 84.3 ± 10.3 | <0.0001 |
| Waist-hip ratio | 0.849 ± 0.07 | 0.837 ± 0.07 | 0.838 ± 0.07 | 0.839 ± 0.07 | 0.842 ± 0.07 | 0.846 ± 0.07 | 0.849 ± 0.07 | 0.853 ± 0.07 | 0.855 ± 0.07 | 0.860 ± 0.07 | 0.872 ± 0.07 | <0.0001 |
| Systolic blood pressure, mm Hg | 117.6 ± 18.1 | 113.2 ± 16.4 | 114.0 ± 16.9 | 114.4 ± 16.7 | 115.5 ± 17.7 | 116.3 ± 17.7 | 117.7 ± 17.6 | 118.5 ± 18.3 | 120.0 ± 18.3 | 121.4 ± 18.3 | 125.0 ± 19.2 | <0.0001 |
| Diastolic blood pressure, mm Hg | 71.1 ± 10.2 | 68.3 ± 9.8 | 68.6 ± 9.6 | 68.8 ± 9.3 | 69.5 ± 9.8 | 70.1 ± 9.8 | 71.1 ± 9.8 | 71.8 ± 10.2 | 72.6 ± 10.0 | 73.7 ± 10.2 | 76.4 ± 10.7 | <0.0001 |
| Fasting blood glucose, mg/dL | 94.2 ± 18.9 | 90.7 ± 15.0 | 91.8 ± 16.8 | 91.9 ± 14.3 | 92.3 ± 14.1 | 93.1 ± 15.2 | 93.9 ± 16.3 | 94.9 ± 18.3 | 95.1 ± 18.4 | 96.5 ± 20.8 | 102.1 ± 32.2 | <0.0001 |
| Glycated hemoglobin, % | 5.77 ± 0.75 | 5.64 ± 0.63 | 5.69 ± 0.67 | 5.70 ± 0.60 | 5.70 ± 0.58 | 5.73 ± 0.64 | 5.76 ± 0.66 | 5.79 ± 0.75 | 5.80 ± 0.71 | 5.86 ± 0.82 | 6.07 ± 1.22 | <0.0001 |
| Triglycerides, mg/dL | 104.0 ± 72.0 | 88.9 ± 65.9 | 92.6 ± 61.9 | 92.6 ± 58.3 | 95.5 ± 61.9 | 99.7 ± 67.9 | 103.0 ± 63.7 | 107.2 ± 75.5 | 111.1 ± 72.2 | 117.6 ± 82.8 | 132.0 ± 92.6 | <0.0001 |
| Total cholesterol, mg/dL | 198.4 ± 35.9 | 181.3 ± 33.0 | 190.0 ± 33.4 | 193.7 ± 33.8 | 196.7 ± 35.0 | 197.9 ± 35.4 | 201.0 ± 35.2 | 202.0 ± 36.1 | 204.1 ± 35.5 | 206.4 ± 35.8 | 210.3 ± 36.6 | <0.0001 |
| LDL-cholesterol, mg/dL | 120.5 ± 31.8 | 107.9 ± 28.6 | 113.0 ± 29.6 | 115.8 ± 29.6 | 118.3 ± 30.8 | 119.5 ± 31.1 | 122.5 ± 31.4 | 123.3 ± 32.0 | 125.1 ± 32.0 | 127.6 ± 32.4 | 131.7 ± 33.0 | <0.0001 |
| HDL-cholesterol, mg/dL | 58.2 ± 13.2 | 56.8 ± 13.1 | 58.7 ± 13.5 | 59.4 ± 13.3 | 59.1 ± 13.1 | 58.9 ± 13.1 | 58.6 ± 13.1 | 58.3 ± 13.3 | 58.2 ± 13.4 | 57.6 ± 13.2 | 56.1 ± 12.9 | <0.0001 |
| Uric acid, mg/dL | 4.88 ± 1.13 | 4.49 ± 1.14 | 4.68 ± 1.08 | 4.72 ± 1.07 | 4.78 ± 1.05 | 4.84 ± 1.09 | 4.91 ± 1.11 | 5.01 ± 1.13 | 5.03 ± 1.10 | 5.10 ± 1.13 | 5.30 ± 1.19 | <0.0001 |
| Smoking status |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Never smoked | 44,120 (94.8) | 4,535 (94.5) | 3,863 (95.6) | 4,247 (95.1) | 4,314 (94.7) | 4,956 (95.1) | 5,407 (94.9) | 3,199 (95.0) | 4,408 (94.8) | 5,227 (94.5) | 3,954 (93.3) |  |
| Stopped smoked | 1,076 (2.3) | 112 (2.3) | 79 (2.0) | 115 (2.6) | 120 (2.6) | 134 (2.6) | 132 (2.3) | 80 (2.4) | 108 (2.3) | 113 (2.0) | 83 (2.0) |  |
| Occasionally smoking | 40 (0.1) | 4 (0.08) | 1 (0.02) | 0 | 5 (0.1) | 5 (0.1) | 4 (0.07) | 2 (0.06) | 7 (0.2) | 3 (0.05) | 9 (0.2) |  |
| Currently smoking | 1,331 (2.9) | 150 (3.1) | 100 (2.5) | 102 (2.3) | 118 (2.6) | 116 (2.2) | 152 (2.7) | 86 (2.6) | 126 (2.7) | 188 (3.4) | 193 (4.6) |  |
| Alcohol drinking status |  |  |  |  |  |  |  |  |  |  |  | 0.8823 |
| Stopped drinking | 381 (0.8) | 40 (0.8) | 34 (0.8) | 37 (0.8) | 32 (0.7) | 49 (0.9) | 45 (0.8) | 28 (0.8) | 45 (1.0) | 43 (0.8) | 28 (0.7) |  |
| Occasionally drinking | 45,344 (97.4) | 4,681 (97.5) | 3,952 (97.8) | 4,352 (97.5) | 4,435 (97.3) | 5,063 (97.2) | 5,540 (97.3) | 3,280 (97.4) | 4,522 (97.3) | 5,380 (97.3) | 4,130 (97.4) |  |
| Currently drinking | 840 (1.8) | 80 (1.7) | 57 (1.4) | 75 (1.7) | 89 (2.0) | 99 (1.9) | 110 (1.9) | 59 (1.8) | 82 (1.8) | 108 (2.0) | 81 (1.9) |  |
| Physical activity |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| With regular exercise | 18,826 (40.4) | 1,469 (30.4) | 1,541 (38.1) | 1,768 (39.6) | 1,845 (40.5) | 2,158 (41.4) | 2,382 (41.8) | 1,419 (42.2) | 2,037 (43.8) | 2,408 (43.6) | 1,799 (42.5) |  |
| Highest educational attainment |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| No formal teaching or up to primary education | 3,370 (7.2) | 218 (4.5) | 249 (6.2) | 318 (7.1) | 291 (6.4) | 390 (7.5) | 429 (7.5) | 255 (7.6) | 367 (7.9) | 468 (8.5) | 385 (9.1) |  |
| Secondary education to high school | 19,657 (42.2) | 1,782 (37.1) | 1,550 (38.4) | 1,781 (39.9) | 1,876 (41.2) | 2,155 (41.4) | 2,458 (43.2) | 1,468 (43.6) | 2,107 (45.3) | 2,500 (45.2) | 1,975 (46.6) |  |
| University to post-graduate studies | 23,527 (50.5) | 2,801 (58.3) | 2,241 (55.5) | 2,363 (53.0) | 2,389 (52.4) | 2,663 (51.1) | 2,804 (49.3) | 1,644 (48.8) | 2,175 (46.8) | 2,563 (46.3) | 1,878 (44.3) |  |

**Table S2:** Characteristics of subjects in the UK Biobank (*N*=386,477) across increasing deciles of Hb levels

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** |  | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | ***P*-value for Trend** |
| **Men, *n* (%)** | 182,048 (47.1) | 17,547 (9.6) | 18,999 (10.4) | 18,073 (9.9) | 19,634 (10.8) | 16,535 (9.1) | 18,664 (10.3) | 17,955 (9.9) | 18,326 (10.1) | 18,021 (9.9) | 18,294 (10.1) |  |
| Decile range, g/dL |  | 10.00-13.79 | 13.80-14.24 | 14.25-14.54 | 14.55-14.80 | 14.81-15.02 | 15.03-15.29 | 15.30-15.51 | 15.52-15.81 | 15.82-16.23 | 16.24-20.00 |  |
| Hemoglobin, g/dL | 15.0 ± 1.0 | 13.2 ± 0.6 | 14.0 ± 0.1 | 14.4 ± 0.1 | 14.7 ± 0.1 | 14.9 ± 0.1 | 15.2 ± 0.1 | 15.4 ± 0.1 | 15.7 ± 0.1 | 16.0 ± 0.1 | 16.7 ± 0.4 | <0.0001 |
| Age, y | 56.8 ± 8.1 | 58.7 ± 7.7 | 57.4 ± 7.9 | 56.9 ± 8.0 | 56.8 ± 8.1 | 56.4 ± 8.2 | 56.4 ± 8.1 | 56.2 ± 8.1 | 56.1 ± 8.2 | 56.1 ± 8.2 | 56.4 ± 8.2 | <0.0001 |
| 40-49 | 41,399 (22.7) | 2,710 (15.4) | 3,793 (20.0) | 3,972 (22.0) | 4,373 (22.3) | 4,023 (24.3) | 4,446 (23.8) | 4,503 (25.1) | 4,602 (25.1) | 4,560 (25.3) | 4,417 (24.1) |  |
| 50-59 | 59,248 (32.6) | 5,140 (29.3) | 6,039 (31.8) | 5,912 (32.7) | 6,440 (32.8) | 5,425 (32.8) | 6,214 (33.3) | 6,061 (33.8) | 6,118 (33.4) | 5,989 (33.2) | 5,910 (32.3) |  |
| 60-70 | 81,401 (44.7) | 9,697 (55.3) | 9,167 (48.3) | 8,189 (45.3) | 8,821 (44.9) | 7,087 (42.9) | 8,004 (42.9) | 7,391 (41.2) | 7,606 (41.5) | 7,472 (41.5) | 7,967 (43.6) |  |
| Weight, kg | 86.2 ± 14.3 | 83.9 ± 15.5 | 84.5 ± 14.3 | 84.9 ± 13.9 | 85.6 ± 14.0 | 86.3 ± 14.1 | 86.5 ± 14.0 | 86.7 ± 13.9 | 87.5 ± 14.1 | 87.8 ± 14.1 | 88.7 ± 14.1 | <0.0001 |
| Body mass index, kg/m2 | 27.9 ± 4.2 | 27.4 ± 4.8 | 27.3 ± 4.3 | 27.4 ± 4.2 | 27.6 ± 4.2 | 27.8 ± 4.2 | 27.9 ± 4.1 | 28.0 ± 4.1 | 28.2 ± 4.1 | 28.4 ± 4.1 | 28.7 ± 4.1 | <0.0001 |
| Waist circumference, cm | 97.0 ± 11.3 | 95.8 ± 12.9 | 95.5 ± 11.7 | 95.8 ± 11.2 | 96.3 ± 11.2 | 96.9 ± 11.1 | 97.0 ± 11.0 | 97.3 ± 10.9 | 97.9 ± 10.9 | 98.4 ± 10.8 | 99.5 ± 10.8 | <0.0001 |
| Waist-hip ratio | 0.936 ± 0.07 | 0.929 ± 0.07 | 0.926 ± 0.07 | 0.928 ± 0.07 | 0.931 ± 0.06 | 0.934 ± 0.06 | 0.935 ± 0.06 | 0.937 ± 0.06 | 0.941 ± 0.06 | 0.944 ± 0.06 | 0.952 ± 0.06 | <0.0001 |
| Systolic blood pressure, mm Hg | 141.1 ± 17.4 | 138.9 ± 18.3 | 139.4 ± 17.5 | 139.7 ± 17.4 | 140.2 ± 17.2 | 140.7 ± 17.1 | 141.3 ± 16.9 | 141.4 ± 17.1 | 142.1 ± 17.2 | 142.9 ± 17.0 | 144.5 ± 17.4 | <0.0001 |
| Diastolic blood pressure, mm Hg | 84.2 ± 10.0 | 79.8 ± 10.0 | 81.6 ± 9.7 | 82.4 ± 9.7 | 83.3 ± 9.7 | 83.9 ± 9.6 | 84.6 ± 9.5 | 85.0 ± 9.6 | 85.9 ± 9.7 | 86.7 ± 9.7 | 88.4 ± 9.8 | <0.0001 |
| Glucose, mmol/L | 5.11 ± 1.21 | 5.39 ± 1.66 | 5.22 ± 1.39 | 5.16 ± 1.29 | 5.17 ± 1.35 | 5.15 ± 1.27 | 5.16 ± 1.29 | 5.13 ± 1.34 | 5.12 ± 1.28 | 5.13 ± 1.34 | 5.13 ± 1.43 | <0.0001 |
| Glycated hemoglobin, mmol/mol | 35.9 ± 6.5 | 38.3 ± 8.7 | 36.8 ± 7.1 | 36.4 ± 6.7 | 36.3 ± 6.7 | 36.1 ± 6.9 | 36.0 ± 6.7 | 35.9 ± 7.8 | 35.7 ± 6.7 | 35.7 ± 7.2 | 35.6 ± 7.6 | <0.0001 |
| Triglycerides, mmol/L | 1.98 ± 1.15 | 1.73 ± 1.06 | 1.81 ± 1.07 | 1.87 ± 1.08 | 1.92 ± 1.12 | 1.98 ± 1.14 | 1.99 ± 1.13 | 2.05 ± 1.17 | 2.09 ± 1.17 | 2.14 ± 1.20 | 2.24 ± 1.23 | <0.0001 |
| Total cholesterol, mmol/L | 5.50 ± 1.13 | 5.11 ± 1.13 | 5.36 ± 1.09 | 5.45 ± 1.10 | 5.49 ± 1.11 | 5.53 ± 1.10 | 5.57 ± 1.11 | 5.60 ± 1.12 | 5.63 ± 1.11 | 5.64 ± 1.13 | 5.66 ± 1.14 | <0.0001 |
| LDL-cholesterol, mmol/L | 3.49 ± 0.86 | 3.16 ± 0.85 | 3.36 ± 0.84 | 3.43 ± 0.84 | 3.48 ± 0.85 | 3.51 ± 0.84 | 3.54 ± 0.85 | 3.57 ± 0.85 | 3.60 ± 0.85 | 3.61 ± 0.86 | 3.64 ± 0.87 | <0.0001 |
| HDL-cholesterol, mmol/L | 1.28 ± 0.31 | 1.32 ± 0.36 | 1.32 ± 0.33 | 1.32 ± 0.31 | 1.30 ± 0.31 | 1.29 ± 0.31 | 1.29 ± 0.30 | 1.27 ± 0.30 | 1.26 ± 0.29 | 1.25 ± 0.29 | 1.22 ± 0.28 | <0.0001 |
| Uric acid, µmol/L | 309.9 ± 80.4 | 347.4 ± 79.9 | 348.0 ± 72.6 | 350.1 ± 70.6 | 351.9 ± 70.8 | 354.4 ± 70.4 | 355.4 ± 69.9 | 357.1 ± 69.1 | 359.0 ± 69.1 | 359.6 ± 68.7 | 365.1 ± 70.3 | <0.0001 |
| Smoking status |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Never smoked | 89,406 (49.1) | 8,000 (45.6) | 9,053 (47.7) | 8,864 (49.1) | 9,676 (49.3) | 8,327 (50.4) | 9,420 (50.5) | 8,922 (49.7) | 9,274 (50.6) | 9,083 (50.4) | 8,787 (48.1) |  |
| Stopped smoked | 70,354 (38.7) | 7,677 (43.8) | 7,971 (42.0) | 7,254 (40.2) | 7,779 (39.6) | 6,336 (38.3) | 7,064 (37.9) | 6,771 (37.7) | 6,707 (36.6) | 6,454 (35.8) | 6,341 (34.7) |  |
| Occasionally smoking | 6,086 (3.3) | 558 (3.2) | 638 (3.4) | 618 (3.4) | 710 (3.6) | 598 (3.6) | 633 (3.4) | 592 (3.3) | 606 (3.3) | 564 (3.1) | 569 (3.1) |  |
| Currently smoking | 16,125 (8.9) | 1,305 (7.4) | 1,327 (7.0) | 1,327 (7.4) | 1,463 (7.5) | 1,268 (7.7) | 1,542 (8.3) | 1,666 (9.3) | 1,729 (9.4) | 1,912 (10.6) | 2,586 (14.1) |  |
| Alcohol drinking status |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Never drank | 3,103 (1.7) | 416 (2.4) | 306 (1.6) | 273 (1.5) | 297 (1.5) | 282 (1.7) | 276 (1.5) | 293 (1.6) | 307 (1.7) | 293 (1.6) | 360 (2.0) |  |
| Stopped drinking | 5,876 (3.2) | 907 (5.2) | 675 (3.6) | 544 (3.0) | 588 (3.0) | 484 (2.9) | 513 (2.8) | 527 (2.9) | 529 (2.9) | 531 (3.0) | 578 (3.2) |  |
| Occasionally drinking | 11,909 (6.6) | 1,392 (7.9) | 1,246 (6.6) | 1,062 (5.9) | 1,134 (5.8) | 1,007 (6.1) | 1,154 (6.2) | 1,100 (6.1) | 1,174 (6.4) | 1,238 (6.9) | 1,402 (7.7) |  |
| Currently drinking | 161,013 (88.5) | 14,812 (84.5) | 16,761 (88.3) | 16,177 (89.6) | 17,596 (89.7) | 14,747 (89.3) | 16,711 (89.6) | 16,024 (89.3) | 16,300 (89.0) | 15,949 (88.6) | 15,936 (87.2) |  |
| Physical activity |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Low | 29,042 (18.8) | 2,637 (17.9) | 2,702 (16.7) | 2,665 (17.2) | 2,964 (17.6) | 2,582 (18.4) | 2,904 (18.3) | 2,906 (19.1) | 3,035 (19.5) | 3,114 (20.5) | 3,533 (23.2) |  |
| Moderate | 59,140 (38.3) | 5,407 (36.8) | 5,934 (36.6) | 5,781 (37.4) | 6,285 (37.4) | 5,411 (38.5) | 6,185 (39.0) | 5,921 (38.8) | 6,212 (39.8) | 5,974 (39.3) | 6,030 (39.6) |  |
| High | 66,223 (42.9) | 6,661 (45.3) | 7,571 (46.7) | 7,088 (45.4) | 7,574 (45.0) | 6,081 (43.2) | 6,756 (42.6) | 6,424 (42.1) | 6,349 (40.7) | 6,120 (40.2) | 5,679 (37.3) |  |
| Highest educational attainment |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| None | 31,680 (17.6) | 3,911 (22.5) | 3,392 (18.0) | 2,960 (16.5) | 3,335 (17.1) | 2,697 (16.5) | 3,008 (16.3) | 2,931 (16.5) | 2,950 (16.2) | 3,052 (17.1) | 3,444 (19.0) |  |
| O-levels, CSEs or equivalent | 45,621 (25.3) | 4,036 (23.2) | 4,453 (23.7) | 4,343 (24.2) | 4,739 (24.3) | 4,103 (25.0) | 4,818 (26.0) | 4,533 (25.4) | 4,910 (27.0) | 4,761 (26.7) | 4,925 (27.2) |  |
| A-levels/AS-levels, NVQ or HNC or equivalent, or other professional qualification | 43,950 (24.4) | 4,100 (23.6) | 4,578 (24.3) | 4,289 (23.9) | 4,820 (24.8) | 3,999 (24.4) | 4,377 (23.7) | 4,386 (24.6) | 4,417 (24.3) | 4,434 (24.8) | 4,550 (25.1) |  |
| Degree | 59,187 (32.8) | 5,329 (30.7) | 6,399 (34.0) | 6,325 (35.3) | 6,575 (33.8) | 5,600 (34.2) | 6,302 (34.1) | 5,965 (33.5) | 5,888 (32.4) | 5,614 (31.4) | 5,190 (28.7) |  |
| **Women, *n* (%)** | 204,429 (52.9) | 20,263 (9.9) | 19,723 (9.7) | 21,308 (10.4) | 20,990 (10.3) | 19,744 (9.7) | 20,399 (10.0) | 19,960 (9.8) | 21,279 (10.4) | 20,445 (10.0) | 20,318 (9.9) |  |
| Decile range, g/dL |  | 8.78-12.39 | 12.40-12.79 | 12.80-13.09 | 13.10-13.30 | 13.31-13.52 | 13.53-13.75 | 13.76-13.99 | 14.00-14.28 | 14.29-14.67 | 14.68-18.05 |  |
| Hemoglobin, g/dL | 13.5 ± 0.9 | 11.8 ± 0.6 | 12.6 ± 0.1 | 12.9 ± 0.1 | 13.2 ± 0.1 | 13.4 ± 0.1 | 13.6 ± 0.1 | 13.9 ± 0.1 | 14.1 ± 0.1 | 14.5 ± 0.1 | 15.1 ± 0.4 | <0.0001 |
| Age, y | 56.4 ± 7.9 | 54.3 ± 8.3 | 55.3 ± 8.1 | 55.7 ± 8.0 | 56.0 ± 7.9 | 56.4 ± 7.9 | 56.5 ± 7.8 | 56.8 ± 7.7 | 57.0 ± 7.7 | 57.5 ± 7.6 | 58.1 ± 7.4 | <0.0001 |
| 40-49 | 47,572 (23.3) | 7,072 (34.9) | 5,699 (28.9) | 5,693 (26.7) | 5,206 (24.8) | 4,475 (22.7) | 4,422 (21.7) | 4,078 (20.4) | 4,170 (19.6) | 3,645 (17.8) | 3,113 (15.3) |  |
| 50-59 | 71,140 (34.8) | 6,561 (32.4) | 6,727 (34.1) | 7,435 (34.9) | 7,468 (35.6) | 7,039 (35.7) | 7,309 (35.8) | 7,070 (35.4) | 7,560 (35.5) | 7,051 (34.5) | 6,920 (34.1) |  |
| 60-70 | 85,717 (41.9) | 6,630 (32.7) | 7,297 (37.0) | 8,180 (38.4) | 8,316 (39.6) | 8,230 (41.7) | 8,668 (42.5) | 8,812 (44.2) | 9,549 (44.9) | 9,749 (47.7) | 10,286 (50.6) |  |
| Had menopause | 123,977 (60.6) | 9,689 (47.4) | 11,025 (56.0) | 12,388 (58.2) | 12,539 (59.8) | 12,142 (61.6) | 12,664 (62.1) | 12,697 (63.7) | 13,603 (64.0) | 13,530 (66.2) | 13,700 (67.5) | <0.0001 |
| Age at menopause | 49.8 ± 5.1 | 49.4 ± 5.3 | 49.6 ± 5.1 | 49.7 ± 5.0 | 49.7 ± 5.0 | 49.8 ± 5.0 | 49.9 ± 5.0 | 49.9 ± 5.0 | 50.0 ± 5.0 | 50.0 ± 5.0 | 49.9 ± 5.2 | <0.0001 |
| Weight, kg | 71.4 ± 13.9 | 69.9 ± 14.3 | 69.7 ± 13.3 | 70.2 ± 13.6 | 70.5 ± 13.5 | 71.0 ± 13.6 | 71.2 ± 13.5 | 71.9 ± 13.7 | 72.5 ± 14.0 | 73.1 ± 14.1 | 74.4 ± 14.8 | <0.0001 |
| Body mass index, kg/m2 | 27.0 ± 5.1 | 26.4 ± 5.3 | 26.3 ± 4.9 | 26.5 ± 5.0 | 26.7 ± 5.0 | 26.9 ± 5.0 | 26.9 ± 4.9 | 27.2 ± 5.0 | 27.4 ± 5.1 | 27.8 ± 5.2 | 28.3 ± 5.4 | <0.0001 |
| Waist circumference, cm | 84.5 ± 12.5 | 82.5 ± 12.8 | 82.4 ± 12.0 | 82.9 ± 12.1 | 83.4 ± 12.1 | 83.9 ± 12.1 | 84.2 ± 12.0 | 85.0 ± 12.2 | 85.7 ± 12.4 | 86.6 ± 12.5 | 88.3 ± 12.9 | <0.0001 |
| Waist-hip ratio | 0.816 ± 0.07 | 0.805 ± 0.07 | 0.805 ± 0.07 | 0.807 ± 0.07 | 0.810 ± 0.07 | 0.812 ± 0.07 | 0.815 ± 0.07 | 0.819 ± 0.07 | 0.823 ± 0.07 | 0.828 ± 0.07 | 0.839 ± 0.07 | <0.0001 |
| Systolic blood pressure, mm Hg | 135.3 ± 19.4 | 130.2 ± 18.5 | 131.6 ± 18.6 | 132.6 ± 18.7 | 133.5 ± 18.8 | 134.7 ± 18.8 | 135.3 ± 18.8 | 136.2 ± 18.8 | 137.6 ± 18.9 | 139.3 ± 19.1 | 141.8 ± 19.4 | <0.0001 |
| Diastolic blood pressure, mm Hg | 80.6 ± 9.9 | 77.0 ± 9.8 | 78.0 ± 9.6 | 78.8 ± 9.6 | 79.5 ± 9.6 | 80.1 ± 9.6 | 80.7 ± 9.6 | 81.3 ± 9.6 | 82.2 ± 9.7 | 83.3 ± 9.7 | 84.8 ± 9.9 | <0.0001 |
| Glucose, mmol/L | 5.05 ± 1.03 | 5.09 ± 1.21 | 5.02 ± 0.98 | 5.02 ± 0.97 | 5.01 ± 0.90 | 5.04 ± 0.97 | 5.04 ± 0.93 | 5.05 ± 0.97 | 5.06 ± 1.01 | 5.08 ± 1.05 | 5.13 ± 1.28 | <0.0001 |
| Glycated hemoglobin, mmol/mol | 35.6 ± 5.7 | 36.2 ± 6.5 | 35.5 ± 5.3 | 35.4 ± 5.3 | 35.4 ± 5.1 | 35.4 ± 5.1 | 35.4 ± 5.2 | 35.5 ± 5.3 | 35.5 ± 5.5 | 35.6 ± 5.8 | 36.1 ± 7.2 | 0.306 |
| Triglycerides, mmol/L | 1.55 ± 0.85 | 1.38 ± 0.78 | 1.41 ± 0.78 | 1.44 ± 0.79 | 1.49 ± 0.81 | 1.52 ± 0.83 | 1.55 ± 0.83 | 1.60 ± 0.87 | 1.63 ± 0.87 | 1.69 ± 0.90 | 1.81 ± 0.96 | <0.0001 |
| Total cholesterol, mmol/L | 5.89 ± 1.12 | 5.53 ± 1.06 | 5.70 ± 1.06 | 5.79 ± 1.08 | 5.84 ± 1.10 | 5.91 ± 1.09 | 5.94 ± 1.11 | 5.98 ± 1.11 | 6.02 ± 1.13 | 6.08 ± 1.15 | 6.12 ± 1.18 | <0.0001 |
| LDL-cholesterol, mmol/L | 3.64 ± 0.87 | 3.36 ± 0.81 | 3.47 ± 0.82 | 3.54 ± 0.83 | 3.59 ± 0.85 | 3.64 ± 0.85 | 3.67 ± 0.86 | 3.71 ± 0.86 | 3.74 ± 0.87 | 3.80 ± 0.88 | 3.85 ± 0.90 | <0.0001 |
| HDL-cholesterol, mmol/L | 1.60 ± 0.38 | 1.58 ± 0.38 | 1.63 ± 0.37 | 1.62 ± 0.38 | 1.62 ± 0.38 | 1.61 ± 0.37 | 1.61 ± 0.38 | 1.60 ± 0.38 | 1.59 ± 0.37 | 1.57 ± 0.37 | 1.52 ± 0.37 | <0.0001 |
| Uric acid, µmol/L | 270.0 ± 65.5 | 256.5 ± 69.0 | 257.5 ± 63.5 | 260.5 ± 62.3 | 265.6 ± 63.1 | 267.4 ± 63.5 | 269.7 ± 63.3 | 273.6 ± 64.2 | 277.1 ± 64.2 | 281.9 ± 65.5 | 290.1 ± 68.1 | <0.0001 |
| Smoking status |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Never smoked | 121,645 (59.5) | 12,507 (61.8) | 12,022 (61.0) | 12,834 (60.3) | 12,654 (60.3) | 11,883 (60.2) | 12,177 (59.7) | 11,963 (60.0) | 12,561 (59.1) | 11,913 (58.3) | 11,131 (54.8) |  |
| Stopped smoked | 64,806 (31.7) | 6,566 (32.4) | 6,440 (32.7) | 7,115 (33.4) | 6,787 (32.3) | 6,399 (32.4) | 6,581 (32.3) | 6,265 (31.4) | 6,685 (31.4) | 6,184 (30.3) | 5,784 (28.5) |  |
| Occasionally smoking | 4,052 (2.0) | 410 (2.0) | 392 (1.9) | 422 (2.0) | 434 (2.1) | 395 (2.0) | 435 (2.1) | 389 (2.0) | 430 (2.0) | 394 (1.9) | 351 (1.7) |  |
| Currently smoking | 13,831 (6.8) | 769 (3.8) | 861 (4.4) | 925 (4.3) | 1,109 (5.3) | 1,061 (5.4) | 1,200 (5.9) | 1,332 (6.7) | 1,586 (7.5) | 1,943 (9.5) | 3,045 (15.0) |  |
| Alcohol drinking status |  |  |  |  |  |  |  |  |  |  |  | 0.8823 |
| Never drank | 8,955 (4.4) | 1,130 (5.6) | 871 (4.4) | 900 (4.2) | 810 (3.9) | 831 (4.2) | 832 (4.1) | 812 (4.1) | 901 (4.2) | 894 (4.4) | 974 (4.8) |  |
| Stopped drinking | 7,219 (3.5) | 991 (4.9) | 710 (3.6) | 707 (3.3) | 716 (3.4) | 642 (3.3) | 654 (3.2) | 652 (3.3) | 734 (3.5) | 667 (3.3) | 746 (3.7) |  |
| Occasionally drinking | 28,538 (14.0) | 3,281 (16.2) | 2,709 (13.7) | 2,896 (13.6) | 2,818 (13.4) | 2,617 (13.3) | 2,646 (13.0) | 2,668 (13.4) | 2,873 (13.5) | 2,897 (14.2) | 3,133 (15.4) |  |
| Currently drinking | 159,593 (78.1) | 14,842 (73.3) | 15,421 (78.2) | 16,790 (78.9) | 16,633 (79.3) | 15,645 (79.3) | 16,254 (79.7) | 15,818 (79.3) | 16,755 (78.8) | 15,977 (78.2) | 15,458 (76.1) |  |
| Physical activity |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| Low | 29,445 (18.5) | 3,027 (19.1) | 2,810 (18.2) | 2,923 (17.4) | 3,016 (18.1) | 2,718 (17.5) | 2,866 (17.9) | 2,919 (18.7) | 2,988 (18.2) | 3,025 (19.3) | 3,153 (20.6) |  |
| Moderate | 68,427 (42.9) | 6,785 (42.7) | 6,522 (42.2) | 7,236 (43.1) | 7,134 (42.8) | 6,783 (43.6) | 6,890 (43.1) | 6,682 (42.7) | 7,091 (43.1) | 6,719 (43.0) | 6,585 (43.0) |  |
| High | 61,530 (38.6) | 6,078 (38.3) | 6,141 (39.7) | 6,639 (39.5) | 6,501 (39.0) | 6,049 (38.9) | 6,239 (39.0) | 6,035 (38.6) | 6,369 (38.7) | 5,901 (37.7) | 5,578 (36.4) |  |
| Highest educational attainment |  |  |  |  |  |  |  |  |  |  |  | <0.0001 |
| None | 35,401 (17.5) | 3,159 (15.7) | 3,117 (15.9) | 3,355 (15.9) | 3,462 (16.6) | 3,238 (16.5) | 3,418 (16.9) | 3,457 (17.5) | 3,723 (17.6) | 4,051 (20.0) | 4,421 (22.0) |  |
| O-levels, CSEs or equivalent | 61,292 (30.2) | 6,297 (31.3) | 5,770 (29.5) | 6,350 (30.1) | 6,272 (30.1) | 5,946 (30.3) | 6,145 (30.4) | 5,959 (30.1) | 6,331 (30.0) | 6,106 (30.2) | 6,116 (30.4) |  |
| A-levels/AS-levels, NVQ or HNC or equivalent, or other professional qualification | 45,130 (22.3) | 4,420 (22.0) | 4,307 (22.0) | 4,822 (22.8) | 4,562 (21.9) | 4,343 (22.2) | 4,455 (22.0) | 4,513 (22.8) | 4,728 (22.4) | 4,448 (22.0) | 4,532 (22.5) |  |
| Degree | 60,913 (30.1) | 6,220 (31.0) | 6,387 (32.6) | 6,604 (31.3) | 6,533 (31.4) | 6,069 (31.0) | 6,221 (30.7) | 5,871 (29.7) | 6,319 (30.0) | 5,642 (27.9) | 5,047 (25.1) |  |

A-levels, Advanced Level; CSE, Certificate of Secondary Education; HNC, Higher National Certificates; NVQ, National Vocational Qualifications; O-levels, Ordinary Level.

**Table S3:** Frequency distribution of metabolic outcomes among subjects in the Taiwan Biobank (*N*=67,237) across increasing deciles of Hb levels

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Metabolic Outcome** |  | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | ***P*-value for Trend** |
| **Men** | 20,670 | 1,997 | 2,110 | 2,250 | 2,024 | 2,269 | 1,535 | 2,192 | 2,433 | 1,761 | 2,099 |  |
| **Hb Decile Range, g/dL** |  | 9.0-13.5 | 13.6-14.1 | 14.2-14.5 | 14.6-14.8 | 14.9-15.1 | 15.2-15.3 | 15.4-15.6 | 15.7-16.0 | 16.1-16.4 | 16.5-20.3 |  |
| MS-NCEP ATP III | 5,317 (25.7) | 407 (20.4) | 387 (18.3) | 461 (20.5) | 421 (20.8) | 541 (23.8) | 389 (25.3) | 586 (26.7) | 695 (28.6) | 576 (32.7) | 854 (40.7) | <0.0001 |
| MS-TW | 5,530 (26.8) | 425 (21.3) | 411 (19.5) | 475 (21.1) | 434 (21.4) | 558 (24.6) | 411 (26.8) | 621 (28.3) | 720 (29.6) | 593 (33.7) | 882 (42.0) | <0.0001 |
| MS-IDF(C) | 4,238 (20.5) | 321 (16.1) | 296 (14.0) | 372 (16.5) | 320 (15.8) | 422 (18.6) | 298 (19.4) | 474 (21.6) | 557 (22.9) | 472 (26.8) | 706 (33.6) | <0.0001 |
| Obesity (BMI >27.0 kg/m2)† | 5,841 (28.3) | 404 (20.2) | 453 (21.5) | 516 (22.9) | 494 (24.4) | 621 (27.4) | 455 (29.6) | 679 (31.0) | 791 (32.5) | 592 (33.6) | 836 (39.8) | <0.0001 |
| Overweight (BMI=24.0-26.9 kg/m2)† | 7,375 (35.7) | 684 (34.3) | 708 (33.6) | 806 (35.8) | 707 (34.9) | 821 (36.2) | 536 (34.9) | 811 (37.0) | 854 (35.1) | 653 (37.1) | 795 (37.9) |  |
| Obesity (BMI >30.0 kg/m2) | 1,921 (9.3) | 126 (6.3) | 129 (6.1) | 158 (7.0) | 157 (7.8) | 182 (8.0) | 129 (8.4) | 221 (10.1) | 269 (11.1) | 206 (11.7) | 344 (16.4) | <0.0001 |
| Overweight (BMI=25.0-29.9 kg/m2) | 8,636 (41.7) | 696 (34.5) | 773 (36.6) | 877 (39.0) | 796 (39.3) | 927 (40.9) | 667 (43.5) | 967 (44.1) | 1,079 (44.4) | 831 (47.2) | 1,023 (48.7) |  |
| Central Obesity (WC >90 cm in men, >80 cm in women) | 7,802 (37.8) | 596 (29.8) | 637 (30.2) | 762 (33.9) | 676 (33.4) | 812 (35.8) | 594 (38.7) | 870 (39.7) | 1,011 (41.6) | 777 (44.1) | 1,067 (50.8) | <0.0001 |
| Hypertension (SBP/DBP >140/>90 mm Hg)‡ | 5,067 (24.5) | 454 (22.7) | 423 (20.1) | 479 (21.3) | 454 (22.4) | 526 (23.2) | 366 (23.8) | 536 (24.5) | 632 (26.0) | 489 (27.8) | 708 (33.7) | <0.0001 |
| Prehypertension (SBP=120-139 mm Hg or DBP=80-89 mm Hg)‡ | 8,980 (43.4) | 865 (42.9) | 927 (44.0) | 964 (42.8) | 874 (43.2) | 1,000 (44.1) | 660 (43.0) | 970 (44.3) | 1,070 (44.0) | 740 (42.0) | 910 (43.4) |  |
| Hyperglycemia based on FBG (>126 mg/dL) | 1,333 (6.5) | 167 (8.4) | 129 (6.1) | 141 (6.3) | 96 (4.7) | 124 (5.5) | 73 (4.8) | 120 (5.5) | 139 (5.7) | 128 (7.3) | 216 (10.3) | 0.0139 |
| Impaired fasting blood glucose (FBG=100-125 mg/dL) | 4,573 (22.1) | 397 (19.7) | 407 (19.3) | 471 (20.9) | 420 (20.8) | 501 (22.1) | 355 (23.1) | 503 (23.0) | 573 (23.6) | 405 (23.0) | 541 (25.8) |  |
| Hyperglycemia based on HbA1c (>6.5%) | 2,425 (11.7) | 316 (15.8) | 254 (12.0) | 255 (11.3) | 201 (9.9) | 239 (10.5) | 144 (9.4) | 221 (10.1) | 269 (11.1) | 201 (11.4) | 325 (15.5) | 0.5479 |
| Elevated glycosylated hemoglobin (HbA1c=5.7-6.4%) | 9,405 (45.5) | 872 (43.2) | 967 (45.8) | 1,054 (46.8) | 937 (46.3) | 1,053 (46.4) | 703 (45.8) | 997 (45.5) | 1,090 (44.8) | 798 (45.3) | 934 (44.5) |  |
| Hypertriglyceridemia (TG >200 mg/dL) | 3,390 (16.4) | 216 (10.8) | 230 (10.9) | 269 (12.0) | 262 (12.9) | 331 (14.6) | 255 (16.6) | 358 (16.3) | 486 (20.0) | 379 (21.5) | 604 (28.8) | <0.0001 |
| Elevated triglycerides (TG=150-199 mg/dL) | 2,859 (13.8) | 187 (9.3) | 240 (11.4) | 258 (11.5) | 255 (12.6) | 299 (13.2) | 218 (14.2) | 335 (15.3) | 384 (15.8) | 292 (16.6) | 391 (18.6) |  |
| Hypercholesterolemia (TC >240 mg/dL) | 1,820 (8.8) | 89 (4.5) | 119 (5.6) | 155 (6.9) | 157 (7.8) | 199 (8.8) | 155 (10.1) | 217 (9.9) | 259 (10.7) | 194 (11.0) | 276 (13.2) | <0.0001 |
| Elevated total-cholesterol (TC=200-239 mg/dL) | 6,110 (29.5) | 368 (18.2) | 541 (25.6) | 617 (27.4) | 571 (28.2) | 712 (31.4) | 506 (33.0) | 706 (32.2) | 780 (32.1) | 580 (32.9) | 729 (34.7) |  |
| High LDL-cholesterol (LDL-C >160 mg/dL) | 2,199 (10.6) | 97 (4.9) | 141 (6.7) | 175 (7.8) | 192 (9.5) | 248 (10.9) | 194 (12.6) | 266 (12.1) | 313 (12.9) | 241 (13.7) | 332 (15.8) | <0.0001 |
| Elevated LDL-cholesterol (LDL-C=130-159 mg/dL) | 5,515 (26.7) | 341 (16.9) | 510 (24.2) | 557 (24.8) | 525 (25.9) | 637 (28.1) | 433 (28.2) | 650 (29.7) | 715 (29.4) | 527 (29.9) | 620 (29.5) |  |
| Low HDL-cholesterol (HDL-C <40 mg/dL in men, <50 mg/dL in women) | 4,779 (23.1) | 504 (25.2) | 408 (19.3) | 455 (20.2) | 397 (19.6) | 482 (21.2) | 341 (22.2) | 509 (23.2) | 574 (23.6) | 469 (26.6) | 640 (30.5) | <0.0001 |
| Hyperuricemia (SUA >7.0 mg/dL in men, >6.0 mg/dL in women) | 6,137 (29.7) | 560 (27.8) | 532 (25.2) | 573 (25.5) | 540 (26.7) | 671 (29.6) | 449 (29.3) | 671 (30.6) | 779 (32.0) | 586 (33.3) | 776 (37.0) | <0.0001 |
| **Women** | 46,567 | 4,801 | 4,043 | 4,464 | 4,558 | 5,211 | 5,698 | 3,368 | 4,650 | 5,534 | 4,240 |  |
| **Hb Decile Range, g/dL** |  | 6.6-11.5 | 11.6-12.1 | 12.2-12.5 | 12.6-12.8 | 12.9-13.1 | 13.2-13.4 | 13.5-13.6 | 13.7-13.9 | 14.0-14.4 | 14.5-18.7 |  |
| MS-NCEP ATP III | 8,794 (18.9) | 576 (12.0) | 543 (13.4) | 578 (13.0) | 618 (13.6) | 838 (16.1) | 1,051 (18.5) | 679 (20.2) | 1,063 (22.9) | 1,390 (25.1) | 1,458 (34.4) | <0.0001 |
| MS-TW | 8,823 (19.0) | 582 (12.1) | 545 (13.5) | 580 (13.0) | 620 (13.6) | 839 (16.1) | 1,056 (18.5) | 681 (20.2) | 1,067 (23.0) | 1,394 (25.2) | 1,459 (34.4) | <0.0001 |
| MS-IDF(C) | 8,053 (17.3) | 521 (10.9) | 497 (12.3) | 534 (12.0) | 557 (12.2) | 764 (14.7) | 956 (16.8) | 627 (18.6) | 967 (20.8) | 1,277 (23.1) | 1,353 (31.9) | <0.0001 |
| Obesity (BMI >27.0 kg/m2)† | 7,648 (16.4) | 664 (13.8) | 518 (12.8) | 550 (12.3) | 584 (12.8) | 708 (13.6) | 932 (16.4) | 588 (17.5) | 819 (17.6) | 1,169 (21.1) | 1,116 (26.3) | <0.0001 |
| Overweight (BMI=24.0-26.9 kg/m2)† | 10,713 (23.0) | 976 (20.3) | 794 (19.6) | 925 (20.7) | 1,013 (22.2) | 1,146 (22.0) | 1,306 (22.9) | 815 (24.2) | 1,162 (25.0) | 1435 (25.9) | 1,141 (26.9) |  |
| Obesity (BMI >30.0 kg/m2) | 2,890 (6.2) | 276 (5.7) | 198 (4.9) | 206 (4.6) | 191 (4.2) | 243 (4.7) | 350 (6.1) | 221 (6.6) | 299 (6.4) | 447 (8.1) | 459 (10.8) | <0.0001 |
| Overweight (BMI=25.0-29.9 kg/m2) | 11,073 (23.8) | 955 (19.7) | 779 (19.3) | 876 (19.6) | 952 (20.9) | 1,132 (21.7) | 1,335 (23.4) | 848 (25.2) | 1,225 (26.3) | 1,625 (29.4) | 1,346 (31.8) |  |
| Central Obesity (WC >90 cm in men, >80 cm in women) | 22,310 (47.9) | 1,932 (40.2) | 1,661 (41.1) | 1,846 (41.4) | 1,979 (43.4) | 2,339 (44.9) | 2,737 (48.0) | 1,705 (50.6) | 2,403 (51.7) | 3,074 (55.6) | 2,634 (62.1) | <0.0001 |
| Hypertension (SBP/DBP >140/>90 mm Hg)‡ | 6,053 (13.0) | 371 (7.7) | 379 (9.4) | 385 (8.6) | 488 (10.7) | 600 (11.5) | 723 (12.7) | 468 (13.9) | 725 (15.6) | 939 (17.0) | 975 (23.0) | <0.0001 |
| Prehypertension (SBP=120-139 mm Hg or DBP=80-89 mm Hg)‡ | 13,318 (28.6) | 1,046 (21.6) | 917 (22.7) | 1,130 (25.3) | 1,169 (25.7) | 1,440 (27.6) | 1,684 (29.6) | 996 (29.6) | 1,465 (31.5) | 1,902 (34.4) | 1,569 (37.0) |  |
| Hyperglycemia based on FBG (>126 mg/dL) | 1,679 (3.6) | 120 (2.5) | 113 (2.8) | 109 (2.4) | 113 (2.5) | 148 (2.8) | 170 (3.0) | 131 (3.9) | 173 (3.7) | 264 (4.8) | 338 (8.0) | <0.0001 |
| Impaired fasting blood glucose (FBG=100-125 mg/dL) | 6,286 (13.5) | 342 (7.1) | 350 (8.7) | 442 (9.9) | 502 (11.0) | 634 (12.2) | 806 (14.2) | 505 (15.0) | 753 (16.2) | 991 (17.9) | 961 (22.7) |  |
| Hyperglycemia based on HbA1c (>6.5%) | 3,505 (7.5) | 241 (5.0) | 239 (5.9) | 271 (6.1) | 262 (5.8) | 321 (6.2) | 389 (6.8) | 277 (8.2) | 370 (8.0) | 512 (9.3) | 623 (14.7) | <0.0001 |
| Elevated glycosylated hemoglobin (HbA1c=5.7-6.4%) | 19,617 (42.1) | 1,614 (33.3) | 1,524 (37.7) | 1,805 (40.4) | 1,861 (40.8) | 2,227 (42.7) | 2,477 (43.5) | 1,427 (42.4) | 2,100 (45.2) | 2,569 (46.4) | 2,013 (47.5) |  |
| Hypertriglyceridemia (TG >200 mg/dL) | 3,407 (7.3) | 206 (4.3) | 208 (5.1) | 239 (5.4) | 249 (5.5) | 311 (6.0) | 380 (6.7) | 262 (7.8) | 384 (8.3) | 558 (10.1) | 610 (14.4) | <0.0001 |
| Elevated triglycerides (TG=150-199 mg/dL) | 4,267 (9.2) | 286 (5.9) | 293 (7.3) | 295 (6.6) | 339 (7.4) | 422 (8.1) | 537 (9.4) | 321 (9.5) | 519 (11.2) | 651 (11.8) | 604 (14.2) |  |
| Hypercholesterolemia (TC >240 mg/dL) | 5,744 (12.3) | 236 (4.9) | 314 (7.8) | 423 (9.5) | 524 (11.5) | 612 (11.7) | 730 (12.8) | 453 (13.5) | 711 (15.3) | 919 (16.6) | 822 (19.4) | <0.0001 |
| Elevated total-cholesterol (TC=200-239 mg/dL) | 15,720 (33.7) | 996 (20.6) | 1,118 (27.7) | 1,374 (30.8) | 1,455 (31.9) | 1,751 (33.6) | 2,082 (36.5) | 1,242 (36.9) | 1,763 (37.9) | 2,186 (39.5) | 1,753 (41.3) |  |
| High LDL-cholesterol (LDL-C >160 mg/dL) | 5,211 (11.2) | 232 (4.8) | 270 (6.7) | 342 (7.7) | 446 (9.8) | 526 (10.1) | 668 (11.7) | 403 (12.0) | 621 (13.4) | 862 (15.6) | 841 (19.8) | <0.0001 |
| Elevated LDL-cholesterol (LDL-C=130-159 mg/dL) | 11,701 (25.1) | 763 (15.8) | 786 (19.4) | 972 (21.8) | 1,055 (23.2) | 1,300 (25.0) | 1,528 (26.8) | 918 (27.3) | 1,373 (29.5) | 1,671 (30.2) | 1,335 (31.5) |  |
| Low HDL-cholesterol (HDL-C <40 mg/dL in men, <50 mg/dL in women) | 12,807 (27.5) | 1,465 (30.5) | 1,056 (26.1) | 1,079 (24.2) | 1,103 (24.2) | 1,297 (24.9) | 1,480 (26.0) | 919 (27.3) | 1,318 (28.3) | 1,666 (30.1) | 1,425 (33.6) | <0.0001 |
| Hyperuricemia (SUA >7.0 mg/dL in men, >6.0 mg/dL in women) | 6,592 (14.1) | 387 (8.0) | 418 (10.3) | 464 (10.4) | 489 (10.7) | 648 (12.4) | 795 (14.0) | 552 (16.4) | 765 (16.5) | 1,015 (18.3) | 1,059 (25.0) | <0.0001 |

†Taiwan Ministry of Health classification for obesity and overweight. ‡Taiwan Society of Cardiology and Taiwan Hypertension Society classification. BMI, body mass index; DBP, diastolic blood pressure; FBG, fasting blood glucose; HbA1c, glycosylated hemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; MS-IDF(C), metabolic syndrome following International Diabetes Federation criteria for Chinese; MS-NCEP ATP III, metabolic syndrome following National Cholesterol Education Program Adult Treatment Panel III criteria; MS-TW, metabolic syndrome following Taiwan criteria; SBP, systolic blood pressure; SUA, serum uric acid; TC, total cholesterol; TG, triglyceride; WC, waist circumference.

**Table S4:** Frequency distribution of metabolic outcomes among subjects in the UK Biobank (*N*=386,477) across increasing deciles of Hb levels

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Metabolic Outcome** |  | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | ***P*-value for Trend** |
| **Men** | 182,048 | 17,547 | 18,999 | 18,073 | 19,634 | 16,535 | 18,664 | 17,955 | 18,326 | 18,021 | 18,294 |  |
| **Hb Decile Range, g/dL** |  | 10.00-13.79 | 13.80-14.24 | 14.25-14.54 | 14.55-14.80 | 14.81-15.02 | 15.03-15.29 | 15.30-15.51 | 15.52-15.81 | 15.82-16.23 | 16.24-20.00 |  |
| MS-NCEP ATP III | 89,330 (49.0) | 8,178 (46.3) | 8,173 (43.8) | 8,178 (44.5) | 9,022 (46.0) | 7,954 (48.1) | 8,899 (48.9) | 9,055 (49.1) | 9,438 (51.5) | 9,748 (54.1) | 10,685 (58.4) | <0.0001 |
| MS-IDF | 79,412 (43.6) | 7,054 (39.9) | 7,098 (38.0) | 7,189 (39.1) | 7,926 (40.4) | 7,065 (42.7) | 7,896 (43.4) | 8,098 (44.0) | 8,498 (46.4) | 8,874 (49.2) | 9,714 (53.1) | <0.0001 |
| Obesity (BMI >30.0 kg/m2) | 46,464 (25.5) | 4,004 (22.8) | 4,065 (21.8) | 4,069 (22.2) | 4,609 (23.5) | 4,067 (24.7) | 4,571 (25.2) | 4,826 (26.3) | 5,083 (27.8) | 5,251 (29.2) | 5,919 (32.5) | <0.0001 |
| Overweight (BMI=25.0-29.9 kg/m2) | 90,139 (49.6) | 7,694 (43.8) | 8,682 (46.7) | 8,984 (49.0) | 9,834 (50.2) | 8,335 (50.6) | 9,207 (50.7) | 9,398 (51.1) | 9,404 (51.5) | 9,240 (51.4) | 9,361 (51.3) |  |
| Central Obesity (WC >94 cm in men, >80 cm in women) | 101,772 (55.9) | 8,552 (48.7) | 9,297 (48.9) | 9,213 (51.0) | 10,441 (53.2) | 9,197 (55.6) | 10,480 (56.2) | 10,374 (57.8) | 10,935 (57.8) | 11,161 (61.9) | 12,122 (66.3) | <0.0001 |
| Hypertension (SBP/DBP >140/>90 mm Hg)† | 89,992 (52.8) | 7,643 (46.1) | 8,243 (47.3) | 8,392 (48.6) | 9,138 (50.0) | 7,975 (51.3) | 9,183 (53.3) | 9,152 (53.7) | 9,527 (55.7) | 9,950 (59.0) | 10,789 (63.5) | <0.0001 |
| Prehypertension (SBP=130-139 mm Hg or DBP=85-89 mm Hg)† | 38,376 (22.5) | 3,633 (21.9) | 3,996 (22.9) | 3,958 (22.9) | 4,303 (23.6) | 3,612 (23.3) | 4,026 (23.4) | 3,879 (22.7) | 3,878 (22.7) | 3,613 (21.4) | 3,478 (20.5) |  |
| Hyperglycemia based on blood glucose‡ (>11.1 mmol/L) | 1,803 (1.0) | 296 (1.67) | 191 (1.02) | 144 (0.78) | 195 (0.99) | 137 (0.83) | 155 (0.85) | 173 (0.94) | 156 (0.85) | 172 (0.95) | 184 (1.01) | <0.0001 |
| Hyperglycemia based on HbA1c (>48 mmol/mol) | 7,967 (4.4) | 1,530 (8.7) | 910 (4.9) | 765 (4.2) | 783 (4.0) | 646 (3.9) | 687 (3.8) | 671 (3.6) | 633 (3.5) | 650 (3.6) | 692 (3.8) | <0.0001 |
| Hypertriglyceridemia (TG >2.30 mmol/L) | 50,563 (29.0) | 3,608 (21.3) | 4,256 (23.7) | 4,503 (25.5) | 5,086 (27.0) | 4,558 (28.7) | 5,020 (28.8) | 5,503 (31.1) | 5,673 (32.4) | 5,872 (34.0) | 6,484 (37.2) | <0.0001 |
| Elevated triglycerides (TG=1.80-2.29 mmol/L) | 29,599 (17.0) | 2,410 (14.2) | 2,736 (15.2) | 2,804 (15.9) | 3,088 (16.4) | 2,749 (17.3) | 3,112 (17.9) | 3,084 (17.4) | 3,153 (18.0) | 3,174 (18.4) | 3,289 (18.9) |  |
| Hypercholesterolemia (TC >6.20 mmol/L) | 45,440 (26.0) | 2,768 (16.3) | 3,881 (21.6) | 4,258 (24.1) | 4,733 (25.1) | 4,186 (26.4) | 4,797 (27.5) | 5,078 (28.6) | 5,167 (29.5) | 5,158 (30.0) | 5,414 (31.1) | <0.0001 |
| Elevated total-cholesterol (TC=5.20-6.29 mmol/L) | 59,227 (33.9) | 4,922 (29.1) | 5,958 (33.2) | 5,949 (33.7) | 6,487 (34.4) | 5,514 (34.7) | 6,093 (34.9) | 6,129 (34.6) | 6,201 (35.4) | 6,018 (34.9) | 5,956 (34.2) |  |
| High LDL-cholesterol (LDL-C >4.10 mmol/L) | 41,243 (23.7) | 2,333 (13.8) | 3,364 (18.8) | 3,760 (21.4) | 4,213 (22.4) | 3,785 (23.9) | 4,433 (25.5) | 4,638 (26.2) | 4,817 (27.5) | 4,794 (27.8) | 5,106 (29.4) | <0.0001 |
| Elevated LDL-cholesterol (LDL-C=3.40-4.09 mmol/L) | 51,721 (30.0) | 4,013 (23.7) | 4,984 (27.8) | 5,091 (28.9) | 5,668 (30.1) | 4,794 (30.2) | 5,323 (30.6) | 5,416 (30.6) | 5,483 (31.3) | 5,505 (32.0) | 5,444 (31.3) |  |
| Low HDL-cholesterol (HDL-C <1.00 mmol/L in men, <1.30 mmol/L in women) | 47,892 (26.3) | 5,171 (29.3) | 4,785 (25.6) | 4,533 (24.6) | 4,924 (25.1) | 4,092 (24.8) | 4,637 (25.5) | 4,746 (25.8) | 4,830 (26.4) | 4,828 (26.8) | 5,346 (29.2) | 0.0006 |
| Hyperuricemia (SUA >416.0 µmol/L in men, >357.0 µmol/L in women) | 32,190 (17.7) | 2,989 (16.9) | 2,943 (15.8) | 2,901 (15.8) | 3,249 (16.6) | 2,833 (17.1) | 3,223 (17.7) | 3,346 (18.2) | 3,440 (18.8) | 3,411 (18.9) | 3,855 (21.1) | <0.0001 |
| **Women** | 204,429 | 20,263 | 19,723 | 21,308 | 20,990 | 19,744 | 20,399 | 19,960 | 21,279 | 20,445 | 20,318 |  |
| **Hb Decile Range, g/dL** |  | 8.78-12.39 | 12.40-12.79 | 12.80-13.09 | 13.10-13.30 | 13.31-13.52 | 13.53-13.75 | 13.76-13.99 | 14.00-14.28 | 14.29-14.67 | 14.68-18.05 |  |
| MS-NCEP ATP III | 74,714 (37.5) | 6,124 (30.0) | 5,871 (29.8) | 6,618 (31.1) | 6,937 (33.1) | 6,872 (34.8) | 7,474 (36.6) | 7,873 (39.4) | 8,901 (41.8) | 9,281 (45.4) | 10,763 (53.0) | <0.0001 |
| MS-IDF | 72,248 (35.3) | 5,686 (27.8) | 5,433 (27.6) | 6,181 (29.0) | 6,504 (31.0) | 6,426 (32.6) | 7,034 (34.5) | 7,461 (37.4) | 8,437 (39.7) | 8,818 (43.1) | 10,268 (50.5) | <0.0001 |
| Obesity (BMI >30.0 kg/m2) | 47,242 (23.1) | 4,026 (19.7) | 3,617 (18.4) | 4,153 (19.5) | 4,294 (20.5) | 4,259 (21.6) | 4,504 (22.1) | 4,814 (24.2) | 5,410 (25.5) | 5,647 (27.7) | 6,518 (32.2) | <0.0001 |
| Overweight (BMI=25.0-29.9 kg/m2) | 75,431 (36.9) | 6,541 (32.1) | 6,950 (35.3) | 7,633 (35.9) | 7,656 (36.5) | 7,318 (37.1) | 7,755 (38.1) | 7,638 (38.3) | 8,252 (38.8) | 7,996 (39.2) | 7,692 (38.0) |  |
| Central Obesity (WC >94 cm in men, >80 cm in women) | 117,475 (57.5) | 9,811 (48.4) | 9,743 (49.4) | 11,073 (52.0) | 11,212 (53.4) | 10,982 (55.6) | 11,715 (57.4) | 12,002 (60.1) | 13,223 (62.1) | 13,394 (65.5) | 14,320 (70.5) | <0.0001 |
| Hypertension (SBP/DBP >140/>90 mm Hg)† | 76,394 (40.0) | 5,612 (29.4) | 5,847 (31.7) | 6,749 (33.9) | 6,950 (36.1) | 7,025 (38.1) | 7,582 (39.7) | 7,873 (42.0) | 8,992 (45.3) | 9,335 (49.0) | 10,429 (55.2) | <0.0001 |
| Prehypertension (SBP=130-139 mm Hg or DBP=85-89 mm Hg)† | 38,153 (20.0) | 3,477 (18.2) | 3,594 (19.5) | 3,881 (19.5) | 3,781 (19.7) | 3,786 (20.5) | 3,936 (20.6) | 3,854 (20.6) | 4,163 (21.0) | 3,932 (20.6) | 3,749 (19.9) |  |
| Hyperglycemia based on blood glucose‡ (>11.1 mmol/L) | 877 (0.4) | 137 (0.67) | 71 (0.36) | 80 (0.38) | 57 (0.27) | 73 (0.37) | 64 (0.31) | 73 (0.37) | 92 (0.43) | 82 (0.40) | 148 (0.73) | 0.1130 |
| Hyperglycemia based on HbA1c (>48 mmol/mol) | 4,495 (2.2) | 731 (3.6) | 385 (2.0) | 438 (2.1) | 379 (1.8) | 340 (1.7) | 364 (1.8) | 360 (1.8) | 404 (1.9) | 474 (2.3) | 620 (3.1) | 0.1087 |
| Hypertriglyceridemia (TG >2.30 mmol/L) | 29,243 (14.9) | 2,051 (10.5) | 2,055 (10.9) | 2,454 (12.0) | 2,595 (12.9) | 2,622 (13.8) | 2,868 (14.6) | 3,021 (15.8) | 3,470 (17.0) | 3,685 (18.8) | 4,422 (22.7) | <0.0001 |
| Elevated triglycerides (TG=1.80-2.20 mmol/L) | 26,113 (13.3) | 2,039 (10.4) | 1,994 (10.6) | 2,222 (10.9) | 2,514 (12.5) | 2,435 (12.9) | 2,612 (13.3) | 2,769 (14.5) | 3,049 (14.9) | 3,116 (15.9) | 3,363 (17.3) |  |
| Hypercholesterolemia (TC >6.20 mmol/L) | 72,959 (37.2) | 4,835 (24.7) | 5,671 (30.0) | 6,737 (33.0) | 7,160 (35.4) | 7,084 (37.4) | 7,656 (39.1) | 7,765 (40.7) | 8,630 (42.3) | 8,567 (43.7) | 8,854 (45.5) | <0.0001 |
| Elevated total-cholesterol (TC=5.20-6.20 mmol/L) | 65,500 (34.9) | 6,941 (35.4) | 6,927 (36.6) | 7,469 (36.5) | 7,174 (35.5) | 6,839 (36.1) | 6,802 (34.7) | 6,610 (34.6) | 6,892 (33.8) | 6,604 (33.7) | 6,242 (32.1) |  |
| High LDL-cholesterol (LDL-C >4.10 mmol/L) | 55,095 (28.1) | 3,400 (17.4) | 3,929 (20.8) | 4,842 (23.7) | 5,265 (26.1) | 5,307 (28.0) | 5,737 (29.3) | 5,887 (30.9) | 6,621 (32.5) | 6,808 (34.8) | 7,299 (37.6) | <0.0001 |
| Elevated LDL-cholesterol (LDL-C=3.40-4.10 mmol/L) | 59,410 (30.3) | 5,333 (27.3) | 5,630 (29.8) | 6,160 (30.2) | 6,131 (30.4) | 5,842 (30.9) | 6,039 (30.9) | 5,970 (31.3) | 6,394 (31.4) | 6,067 (31.0) | 5,844 (30.1) |  |
| Low HDL-cholesterol (HDL-C <1.00 mmol/L in men, <1.30 mmol/L in women) | 65,764 (32.1) | 6,987 (34.2) | 5,962 (30.2) | 6,521 (30.6) | 6,339 (30.2) | 6,006 (30.4) | 6,226 (30.5) | 6,399 (32.1) | 6,867 (32.3) | 6,798 (33.3) | 7,659 (37.7) | <0.0001 |
| Hyperuricemia (SUA >416.0 µmol/L in men, >357.0 µmol/L in women) | 18,869 (9.2) | 1,514 (7.4) | 1,297 (6.6) | 1,430 (6.7) | 1,614 (7.7) | 1,604 (8.1) | 1,787 (8.8) | 1,889 (9.5) | 2,230 (10.5) | 2,449 (12.0) | 3,055 (15.0) | <0.0001 |

†European Society of Cardiology/National Institute for Health and Care Excellence classification. ‡Based on non-fasting/random blood biochemistry measured within 24 hours. BMI, body mass index; DBP, diastolic blood pressure; HbA1c, glycosylated hemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; MS-IDF, metabolic syndrome following International Diabetes Federation criteria; MS-NCEP ATP III, metabolic syndrome following National Cholesterol Education Program Adult Treatment Panel III criteria; SBP, systolic blood pressure; SUA, serum uric acid; TC, total cholesterol; TG, triglyceride; WC, waist circumference.

**Table S5:** Frequency distribution of self-reported metabolic conditions among subjects in the Taiwan Biobank (*N*=67,237) across increasing deciles of Hb levels

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Self-reported Metabolic Conditions** |  | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | ***P*-value for Trend** |
| **Men** | 20,670 | 1,997 | 2,110 | 2,250 | 2,024 | 2,269 | 1,535 | 2,192 | 2,433 | 1,761 | 2,099 |  |
| **Hb Decile Range, g/dL** |  | 9.0-13.5 | 13.6-14.1 | 14.2-14.5 | 14.6-14.8 | 14.9-15.1 | 15.2-15.3 | 15.4-15.6 | 15.7-16.0 | 16.1-16.4 | 16.5-20.3 |  |
| Hypertension | 3,811 (18.4) | 453 (22.7) | 432 (20.5) | 416 (18.5) | 359 (17.7) | 413 (18.2) | 251 (16.4) | 388 (17.7) | 403 (16.6) | 279 (15.8) | 417 (19.9) | <0.0001 |
| Diabetes mellitus | 1,532 (7.4) | 267 (13.4) | 189 (9.0) | 174 (7.7) | 143 (7.1) | 144 (6.4) | 81 (5.3) | 127 (5.8) | 145 (6.0) | 99 (5.6) | 163 (7.8) | <0.0001 |
| Hyperlipidemia | 2,063 (10.0) | 245 (12.3) | 202 (9.6) | 230 (10.2) | 213 (10.5) | 217 (9.6) | 120 (7.8) | 219 (10.0) | 221 (9.1) | 170 (9.7) | 226 (10.8) | 0.0904 |
| Gout | 2,060 (10.0) | 217 (10.9) | 225 (10.7) | 209 (9.3) | 175 (8.7) | 227 (10.0) | 145 (9.5) | 242 (11.0) | 233 (9.6) | 146 (8.3) | 241 (11.5) | 0.9363 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Women** | 46,567 | 4,801 | 4,043 | 4,464 | 4,558 | 5,211 | 5,698 | 3,368 | 4,650 | 5,534 | 4,240 |  |
| **Hb Decile Range, g/dL** |  | 6.6-11.5 | 11.6-12.1 | 12.2-12.5 | 12.6-12.8 | 12.9-13.1 | 13.2-13.4 | 13.5-13.6 | 13.7-13.9 | 14.0-14.4 | 14.5-18.7 |  |
| Hypertension | 4,915 (10.6) | 294 (6.1) | 307 (7.6) | 407 (9.1) | 424 (9.3) | 491 (9.4) | 587 (10.3) | 389 (11.6) | 586 (12.6) | 737 (13.3) | 693 (16.3) | <0.0001 |
| Diabetes mellitus | 2,108 (4.5) | 189 (3.9) | 179 (4.4) | 194 (4.4) | 207 (4.5) | 198 (3.8) | 238 (4.2) | 141 (4.2) | 210 (4.5) | 294 (5.3) | 258 (6.1) | <0.0001 |
| Hyperlipidemia | 3,271 (7.0) | 172 (3.6) | 212 (5.2) | 236 (5.3) | 304 (6.7) | 397 (7.6) | 411 (7.2) | 269 (8.0) | 384 (8.3) | 473 (8.6) | 413 (9.7) | <0.0001 |
| Gout | 255 (0.55) | 22 (0.45) | 19 (0.47) | 28 (0.63) | 23 (0.50) | 27 (0.52) | 31 (0.54) | 13 (0.39) | 22 (0.47) | 39 (0.70) | 31 (0.73) | 0.1001 |

**Table S6:** Frequency distribution of self-reported metabolic conditions among subjects in the UK Biobank (*N*=386,477) across increasing deciles of Hb levels

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Self-reported Metabolic Conditions** |  | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | ***P*-value for Trend** |
| **Men** | 182,048 | 17,547 | 18,999 | 18,073 | 19,634 | 16,535 | 18,664 | 17,955 | 18,326 | 18,021 | 18,294 |  |
| **Hb Decile Range, g/dL** |  | 10.00-13.79 | 13.80-14.24 | 14.25-14.54 | 14.55-14.80 | 14.81-15.02 | 15.03-15.29 | 15.30-15.51 | 15.52-15.81 | 15.82-16.23 | 16.24-20.00 |  |
| Hypertension | 63,574 (34.9) | 7,458 (42.2) | 6,406 (34.3) | 6,065 (33.0) | 6,512 (33.2) | 5,420 (32.8) | 6,053 (33.3) | 6,026 (32.7) | 6,165 (33.6) | 6,331 (35.1) | 7,138 (39.0) | 0.0053 |
| Diagnosis by a doctor† | 46,725 (25.7) | 4,716 (26.7) | 4,373 (23.4) | 4,323 (23.5) | 4,753 (24.2) | 4,034 (24.4) | 4,559 (25.1) | 4,563 (24.8) | 4,777 (26.1) | 4,942 (27.4) | 5,685 (31.1) | <0.0001 |
| Use of medication‡ | 17,749 (9.7) | 1,736 (9.8) | 1,611 (8.6) | 1,598 (8.7) | 1,766 (9.0) | 1,506 (9.1) | 1,707 (9.4) | 1,693 (9.2) | 1,837 (10.0) | 1,890 (10.5) | 2,405 (13.1) | <0.0001 |
| Type of medication§ | 46,974 (25.8) | 6,274 (35.5) | 4,996 (26.8) | 4,606 (25.0) | 4,821 (24.6) | 3,961 (24.0) | 4,382 (24.1) | 4,244 (23.0) | 4,303 (23.5) | 4,383 (24.3) | 5,004 (27.4) | <0.0001 |
| Non-cancer illness†† | 54,519 (29.9) | 6,179 (35.0) | 5,377 (28.8) | 5,069 (27.6) | 5,541 (28.2) | 4,622 (28.0) | 5,198 (28.6) | 5,228 (28.4) | 5,420 (29.6) | 5,546 (30.8) | 6,339 (34.6) | <0.0001 |
| Diabetes mellitus | 11,760 (6.5) | 2,375 (13.4) | 1,419 (7.6) | 1,193 (6.5) | 1,142 (5.8) | 965 (5.8) | 1,011 (5.6) | 937 (5.1) | 904 (4.9) | 873 (4.8) | 941 (5.1) | <0.0001 |
| Diagnosis by a doctor† | 11,584 (6.4) | 2,346 (13.3) | 1,401 (7.5) | 1,180 (6.4) | 1,128 (5.8) | 944 (5.7) | 993 (5.5) | 928 (5.0) | 888 (4.9) | 861 (4.8) | 915 (5.0) | <0.0001 |
| Use of medication‡ | 336 (0.18) | 42 (0.24) | 37 (0.20) | 38 (0.21) | 39 (0.20) | 34 (0.21) | 29 (0.16) | 28 (0.15) | 31 (0.17) | 32 (0.18) | 26 (0.14) | 0.0177 |
| Type of medication§ | 8,420 (4.6) | 2,007 (11.4) | 1,103 (5.9) | 886 (4.8) | 829 (4.2) | 663 (4.0) | 675 (3.7) | 597 (3.2) | 600 (3.3) | 555 (3.0) | 505 (2.8) | <0.0001 |
| Non-cancer illness†† | 11,349 (6.2) | 2,305 (13.0) | 1,371 (7.3) | 1,151 (6.3) | 1,107 (5.6) | 930 (5.6) | 965 (5.3) | 903 (4.9) | 874 (4.8) | 843 (4.7) | 900 (4.9) | <0.0001 |
| Hyperlipidemia | 44,575 (24.5) | 6,123 (34.6) | 5,052 (27.1) | 4,612 (25.1) | 4,793 (24.4) | 3,850 (23.3) | 4,255 (23.4) | 4,035 (21.9) | 3,977 (21.7) | 3,937 (21.9) | 3,941 (21.5) | <0.0001 |
| Use of medication‡ | 41,008 (22.5) | 5,719 (32.4) | 4,675 (25.0) | 4,239 (23.0) | 4,427 (22.6) | 3,555 (21.5) | 3,895 (21.4) | 3,681 (20.0) | 3,654 (19.9) | 3,591 (19.9) | 3,572 (19.5) | <0.0001 |
| Type of medication§ | 39,886 (21.9) | 5,550 (31.4) | 4,584 (24.5) | 4,134 (22.5) | 4,329 (22.1) | 3,427 (20.7) | 3,783 (20.8) | 3,574 (19.4) | 3,512 (19.2) | 3,522 (19.5) | 3,471 (19.0) | <0.0001 |
| Non-cancer illness†† | 27,512 (15.1) | 3,393 (19.2) | 3,086 (16.5) | 2,848 (15.5) | 2,951 (15.0) | 2,433 (14.7) | 2,726 (15.0) | 2,523 (13.7) | 2,531 (13.8) | 2,497 (13.9) | 2,524 (13.8) | <0.0001 |
| Gout | 5,770 (3.2) | 731 (4.1) | 637 (3.4) | 551 (3.0) | 613 (3.1) | 496 (3.0) | 551 (3.0) | 526 (2.9) | 549 (3.0) | 542 (3.0) | 574 (3.1) | <0.0001 |
| Type of medication§ | 4,179 (2.3) | 581 (3.3) | 466 (2.5) | 412 (2.2) | 426 (2.2) | 370 (2.2) | 381 (2.1) | 357 (1.9) | 383 (2.1) | 374 (2.1) | 429 (2.3) | <0.0001 |
| Non-cancer illness†† | 5,209 (2.9) | 627 (3.6) | 575 (3.1) | 506 (2.8) | 558 (2.8) | 456 (2.8) | 503 (2.8) | 479 (2.6) | 492 (2.7) | 495 (2.8) | 518 (2.8) | <0.0001 |
| **Women** | 204,429 | 20,263 | 19,723 | 21,308 | 20,990 | 19,744 | 20,399 | 19,960 | 21,279 | 20,445 | 20,318 |  |
| **Hb Decile Range, g/dL** |  | 8.78-12.39 | 12.40-12.79 | 12.80-13.09 | 13.10-13.30 | 13.31-13.52 | 13.53-13.75 | 13.76-13.99 | 14.00-14.28 | 14.29-14.67 | 14.68-18.05 |  |
| Hypertension | 54,087 (26.4) | 4,792 (23.4) | 4,391 (22.3) | 4,745 (22.3) | 5,031 (24.0) | 4,807 (24.4) | 5,084 (24.9) | 5,352 (26.8) | 6,023 (28.3) | 6,409 (31.4) | 7,453 (36.7) | <0.0001 |
| Diagnosis by a doctor† | 44,754 (21.9) | 3,628 (17.8) | 3,488 (17.7) | 3,811 (17.9) | 4,079 (19.4) | 4,008 (20.3) | 4,234 (20.8) | 4,521 (22.7) | 5,103 (24.0) | 5,484 (26.8) | 6,398 (31.5) | <0.0001 |
| Use of medication‡ | 20,305 (9.9) | 1,579 (7.7) | 1,556 (7.9) | 1,717 (8.1) | 1,769 (8.4) | 1,860 (9.4) | 1,906 (9.3) | 1,999 (10.0) | 2,340 (11.0) | 2,485 (12.2) | 3,094 (15.2) | <0.0001 |
| Type of medication§ | 38,685 (18.9) | 3,618 (17.7) | 3,176 (16.1) | 3,398 (16.0) | 3,558 (17.0) | 3,374 (17.1) | 3,591 (17.6) | 3,723 (18.7) | 4,257 (20.0) | 4,511 (22.1) | 5,479 (27.0) | <0.0001 |
| Non-cancer illness†† | 46,643 (22.8) | 3,915 (19.2) | 3,715 (18.8) | 4,008 (18.8) | 4,280 (20.4) | 4,141 (21.0) | 4,390 (21.5) | 4,652 (23.3) | 5,265 (24.7) | 5,618 (27.5) | 6,659 (32.8) | <0.0001 |
| Diabetes mellitus | 6,910 (3.4) | 1,106 (5.4) | 673 (3.4) | 688 (3.2) | 595 (2.8) | 586 (3.0) | 581 (2.9) | 574 (2.9) | 618 (2.9) | 687 (3.4) | 802 (4.0) | <0.0001 |
| Diagnosis by a doctor† | 6,745 (3.3) | 1,088 (5.3) | 662 (3.4) | 670 (3.1) | 577 (2.8) | 570 (2.9) | 563 (2.8) | 557 (2.8) | 596 (2.8) | 675 (3.3) | 787 (3.9) | <0.0001 |
| Use of medication‡ | 242 (0.12) | 38 (0.19) | 19 (0.10) | 36 (0.17) | 21 (0.10) | 22 (0.11) | 27 (0.13) | 20 (0.10) | 24 (0.11) | 19 (0.09) | 16 (0.08) | 0.0039 |
| Type of medication§ | 4,565 (2.2) | 910 (4.5) | 480 (2.4) | 472 (2.2) | 399 (1.9) | 381 (1.9) | 387 (1.8) | 350 (1.8) | 365 (1.7) | 400 (2.0) | 421 (2.1) | <0.0001 |
| Non-cancer illness†† | 6,011 (2.9) | 980 (4.8) | 581 (3.0) | 590 (2.8) | 524 (2.5) | 495 (2.5) | 504 (2.5) | 480 (2.4) | 534 (2.5) | 608 (3.0) | 715 (3.5) | <0.0001 |
| Hyperlipidemia | 28,136 (13.8) | 2,736 (13.4) | 2,441 (12.4) | 2,643 (12.4) | 2,723 (13.0) | 2,439 (12.4) | 2,657 (13.0) | 2,770 (13.9) | 3,046 (14.3) | 3,125 (15.3) | 3,556 (17.5) | <0.0001 |
| Use of medication‡ | 25,370 (12.4) | 2,488 (12.2) | 2,218 (11.3) | 2,374 (11.1) | 2,443 (11.6) | 2,169 (11.0) | 2,418 (11.9) | 2,503 (12.5) | 2,746 (12.9) | 2,794 (13.7) | 3,217 (15.8) | <0.0001 |
| Type of medication§ | 24,300 (11.9) | 2,388 (11.7) | 2,112 (10.7) | 2,251 (10.6) | 2,361 (11.3) | 2,056 (10.4) | 2,322 (11.4) | 2,380 (11.9) | 2,636 (12.4) | 2,717 (13.3) | 3,077 (15.1) | <0.0001 |
| Non-cancer illness†† | 19,687 (9.6) | 1,682 (8.2) | 1,645 (8.3) | 1,836 (8.6) | 1,921 (9.2) | 1,772 (9.0) | 1,872 (9.2) | 1,973 (9.9) | 2,158 (10.1) | 2,267 (11.1) | 2,561 (12.6) | <0.0001 |
| Gout | 436 (0.21) | 61 (0.30) | 44 (0.22) | 36 (0.17) | 42 (0.20) | 34 (0.17) | 39 (0.19) | 38 (0.19) | 39 (0.18) | 40 (0.20) | 63 (0.31) | 0.9663 |
| Type of medication§ | 310 (0.15) | 46 (0.23) | 35 (0.18) | 28 (0.13) | 28 (0.13) | 25 (0.13) | 25 (0.12) | 24 (0.12) | 26 (0.12) | 27 (0.13) | 46 (0.23) | 0.4273 |
| Non-cancer illness†† | 363 (0.18) | 47 (0.23) | 33 (0.17) | 34 (0.16) | 36 (0.17) | 27 (0.14) | 36 (0.18) | 33 (0.17) | 32 (0.15) | 35 (0.17) | 50 (0.25) | 0.7946 |

†Data fields 6150 and 2443 for self-reported diagnosis of high blood pressure and diabetes by a doctor. ‡Data fields 6177 and 6153 for self-reported use of medications. §Data field 20003 for type of prescription medications by verbal interview. ††Data field 20002 for self-reported non-cancer illnesses (hypertension, essential hypertension, diabetes, type 2 diabetes, high cholesterol, and gout).

**Table S7:** Cases of metabolic disorders from hospital in-patient records of UK Biobank subjects (*N*=386,477) across increasing deciles of Hb levels

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Diagnoses†** |  | **D1** | **D2** | **D3** | **D4** | **D5** | **D6** | **D7** | **D8** | **D9** | **D10** | ***P*-value for Trend** |
| **Men** | 182,048 | 17,547 | 18,999 | 18,073 | 19,634 | 16,535 | 18,664 | 17,955 | 18,326 | 18,021 | 18,294 |  |
| **Hb Decile Range, g/dL** |  | 10.00-13.79 | 13.80-14.24 | 14.25-14.54 | 14.55-14.80 | 14.81-15.02 | 15.03-15.29 | 15.30-15.51 | 15.52-15.81 | 15.82-16.23 | 16.24-20.00 |  |
| Hypertension | 46,142 (25.3) | 6,012 (34.0) | 4,720 (25.3) | 4,397 (23.9) | 4,710 (24.0) | 3,879 (23.5) | 4,341 (23.9) | 4,185 (22.7) | 4,320 (23.6) | 4,427 (24.6) | 5,151 (28.2) | <0.0001 |
| ICD9 diagnoses | 85 (0.05) | 16 (0.09) | 5 (0.03) | 7 (0.04) | 7 (0.04) | 6 (0.04) | 10 (0.05) | 10 (0.05) | 4 (0.02) | 9 (0.05) | 11 (0.06) | 0.7285 |
| ICD10 diagnoses | 46,108 (25.3) | 6,008 (34.0) | 4,718 (25.3) | 4,394 (23.9) | 4,707 (24.0) | 3,878 (23.5) | 4,335 (23.8) | 4,181 (22.7) | 4,318 (23.6) | 4,424 (24.6) | 5,145 (28.1) | <0.0001 |
| Diabetes Mellitus | 13,561 (17.4) | 2,496 (14.1) | 1,470 (7.9) | 1,235 (6.7) | 1,289 (6.6) | 1,076 (6.5) | 1,180 (6.5) | 1,138 (6.2) | 1,138 (6.2) | 1,156 (6.4) | 1,383 (7.6) | <0.0001 |
| ICD9 diagnoses | 58 (0.03) | 17 (0.10) | 4 (0.02) | 7 (0.04) | 5 (0.03) | 4 (0.02) | 5 (0.03) | 5 (0.03) | 2 (0.01) | 4 (0.02) | 5 (0.03) | 0.0026 |
| ICD10 diagnoses | 13,548 (7.5) | 2,494 (14.1) | 1,469 (7.9) | 1,233 (6.7) | 1,287 (6.6) | 1,075 (6.5) | 1,179 (6.5) | 1,136 (6.2) | 1,138 (6.4) | 1155 (14.1) | 1,382 (7.6) | <0.0001 |
| Lipids Disorders | 24,390 (13.4) | 1,617 (7.9) | 1,328 (6.7) | 1,478 (6.9) | 1,475 (7.0) | 1,316 (6.7) | 1,412 (6.9) | 1,407 (7.1) | 1,556 (7.3) | 1,646 (8.1) | 1,992 (9.8) | <0.0001 |
| ICD9 diagnoses | 28 (0.02) | 6 (0.03) | 3 (0.02) | 2 (0.01) | 5 (0.03) | 2 (0.01) | 1 (0.01) | 1 (0.01) | 3 (0.02) | 1 (0.01) | 4 (0.02) | 0.1903 |
| ICD10 diagnoses | 24,373 (13.4) | 3,370 (19.1) | 2,699 (14.5) | 2,439 (13.3) | 2,568 (13.1) | 2,119 (12.8) | 2,295 (12.6) | 2,209 (12.0) | 2,180 (11.9) | 2,241 (12.4) | 2,253 (12.3) | <0.0001 |
| Gout | 3,568 (2.0) | 602 (3.4) | 391 (2.1) | 333 (1.8) | 357 (1.8) | 267 (1.6) | 321 (1.8) | 302 (1.6) | 291 (1.6) | 324 (1.8) | 380 (2.1) | <0.0001 |
| ICD9 diagnoses | 7 | 3 (0.03) | 2 (0.01) | 0 | 0 | 0 | 0 | 0 | 0 | 1 (0.01) | 1 (0.01) | - |
| ICD10 diagnoses | 3,562 (2.0) | 600 (3.4) | 389 (2.1) | 333 (1.8) | 357 (1.8) | 267 (1.6) | 321 (1.8) | 302 (1.6) | 291 (1.6) | 323 (1.8) | 379 (2.1) | <0.0001 |
| **Women** | 204,429 | 20,263 | 19,723 | 21,308 | 20,990 | 19,744 | 20,399 | 19,960 | 21,279 | 20,445 | 20,318 |  |
| **Hb Decile Range, g/dL** |  | 8.78-12.39 | 12.40-12.79 | 12.80-13.09 | 13.10-13.30 | 13.31-13.52 | 13.53-13.75 | 13.76-13.99 | 14.00-14.28 | 14.29-14.67 | 14.68-18.05 |  |
| Hypertension | 37,706 (18.4) | 3,709 (18.1) | 3,220 (16.3) | 3,280 (15.4) | 3,470 (16.5) | 3,352 (17.0) | 3,483 (17.1) | 3,619 (18.1) | 4,103 (19.3) | 4,245 (20.8) | 5,225 (25.7) | <0.0001 |
| ICD9 diagnoses | 69 (0.03) | 8 (0.04) | 4 (0.02) | 9 (0.04) | 9 (0.04) | 5 (0.03) | 4 (0.02) | 3 (0.02) | 9 (0.04) | 9 (0.04) | 9 (0.04) | 0.6071 |
| ICD10 diagnoses | 37,666 (18.4) | 3,707 (18.1) | 3,218 (16.2) | 3,275 (15.4) | 3,465 (16.5) | 3,350 (17.0) | 3,479 (17.1) | 3,617 (18.1) | 4,098 (19.3) | 4,237 (20.7) | 5,220 (25.7) | <0.0001 |
| Diabetes Mellitus | 8,069 (3.9) | 1,194 (5.8) | 727 (3.7) | 709 (3.3) | 680 (3.2) | 637 (3.2) | 680 (3.3) | 667 (3.3) | 740 (3.5) | 862 (4.2) | 1173 (5.8) | 0.0895 |
| ICD9 diagnoses | 44 (0.02) | 10 (0.05) | 9 (0.05) | 4 (0.02) | 3 (0.01) | 5 (0.03) | 3 (0.01) | 2 (0.01) | 1 | 1 | 6 (0.03) | 0.0032 |
| ICD10 diagnoses | 8,053 (3.9) | 1,194 (5.8) | 724 (3.7) | 707 (3.3) | 678 (3.2) | 633 (3.2) | 678 (3.3) | 667 (3.3) | 740 (3.5) | 862 (4.2) | 1,170 (5.8) | 0.0848 |
| Lipids Disorders | 15,227 (7.4) | 1,617 (7.9) | 1,328 (6.7) | 1,478 (6.9) | 1,475 (7.0) | 1,316 (6.7) | 1,412 (6.9) | 1,407 (7.1) | 1,556 (7.3) | 1,646 (8.1) | 1,992 (9.8) | <0.0001 |
| ICD9 diagnoses | 19 (0.01) | 1 | 2 (0.01) | 1 | 2 (0.01) | 0 | 1 | 2 (0.01) | 2 (0.01) | 3 (0.01) | 5 (0.02) | 0.0508 |
| ICD10 diagnoses | 15,213 (7.4) | 1,616 (7.9) | 1,326 (6.7) | 1,477 (6.9) | 1,473 (7.0) | 1,316 (6.7) | 1,411 (6.9) | 1,407 (7.1) | 1,555 (7.3) | 1,644 (8.0) | 1,988 (9.8) | <0.0001 |
| Gout | 498 (0.24) | 83 (0.41) | 42 (0.21) | 35 (0.16) | 51 (0.24) | 48 (0.24) | 38 (0.19) | 46 (0.23) | 43 (0.20) | 51 (0.25) | 61 (0.30) | 0.3345 |
| ICD9 diagnoses | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | - |
| ICD10 diagnoses | 497 (0.24) | 83 (0.41) | 42 (0.21) | 35 (0.16) | 51 (0.24) | 48 (0.24) | 38 (0.19) | 46 (0.23) | 42 (0.20) | 51 (0.25) | 61 (0.30) | 0.3148 |

†Data fields 41203 and 41205 provided diagnoses data from the hospital in-patient records of a subject, which are coded according to the International Classification of Diseases version-9 (ICD-9). Data fields 41202 and 41204 provided diagnoses data from the hospital in-patient records of a subject, which are coded according to the International Classification of Diseases version-10 (ICD-10).

**Table S8:** Cross-tabulation of cases in the Taiwan Biobank based on self-reported metabolic disorders and high levels of biochemical markers

|  |  |  |  |
| --- | --- | --- | --- |
| **Metabolic Outcome** | **All (*N*=67,237)** | **Men (*n*=20,670)** | **Women (*n*=46,567)** |
| **A. Central obesity (based on ethnic-specific WC cutoff)** | **30,112 (44.8)** | **7,802 (37.8)** | **22,310 (47.9)** |
| **B. Hypertension** | **16,078 (23.9)** | **7,076 (34.2)** | **9,002 (19.3)** |
| High blood pressure | 11,124 (16.5) | 5,070 (24.5) | 6,054 (13.0) |
| Self-reported hypertension | 8,730 (13.0) | 3,815 (18.4) | 4,915 (10.6) |
| **C. Diabetes mellitus** | **6,875 (10.2)** | **2,810 (13.6)** | **4,065 (8.7)** |
| High glucose or HbA1c | 6,170 (9.2) | 2,532 (12.2) | 3,638 (7.8) |
| Self-reported diabetes | 3,641 (5.4) | 1,533 (7.4) | 2,108 (4.5) |
| **D. Dyslipidemia** | **23,066 (34.3)** | **7,505 (36.3)** | **15,561 (33.4)** |
| Hypertriglyceridemia or low HDL-C | 20,039 (29.8) | 6,383 (30.9) | 13,656 (29.3) |
| Self-reported hyperlipidemia | 5,335 (7.9) | 2,064 (10.0) | 3,271 (7.0) |
| **E. Gout** | **13,580 (20.2)** | **6,876 (33.3)** | **6,704 (14.4)** |
| Hyperuricemia | 12,729 (18.9) | 6,137 (29.7) | 6,592 (14.1) |
| Self-reported gout | 2,318 (3.4) | 2,063 (9.8) | 255 (0.6) |

HbA1c, glycated hemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; WC, waist circumference.

**Table S9:** Cross-tabulation of cases in the UK Biobank based on high levels of anthropometric and biochemical markers, self-reported metabolic conditions, and hospital in-patient records of subjects

|  |  |  |  |
| --- | --- | --- | --- |
| **Metabolic Disorder** | **All (*N*=386,477)** | **Men (*n*=182,048)** | **Women (*n*=204,429)** |
| **A. Central obesity (based on ethnic-specific WC cutoff)** | **219,247 (56.7)** | **101,772 (55.9)** | **117,475 (57.5)** |
| **B. Hypertension** | **218,759 (56.6)** | **116,701 (64.1)** | **102,058 (49.9)** |
| High blood pressure | 166,386 (43.0) | 89,992 (49.4) | 76,394 (37.3) |
| Self-reported hypertension | 117,661 (30.4) | 63,574 (34.9) | 54,087 (26.4) |
| ICD diagnoses | 83,848 (21.7) | 46,142 (25.3) | 37,706 (18.4) |
| **C. Diabetes mellitus** | **27,750 (7.2)** | **17,180 (9.4)** | **10,570 (5.2)** |
| High glucose or HbA1c | 12,725 (3.3) | 8,158 (4.5) | 4,567 (2.2) |
| Self-reported diabetes | 18,670 (4.8) | 11,760 (6.5) | 6,910 (3.4) |
| ICD diagnoses | 21,630 (5.6) | 13,561 (7.4) | 8,069 (3.9) |
| **D. Dyslipidemia** | **200,565 (51.9)** | **105,275 (57.8)** | **95,290 (46.6)** |
| Hypertriglyceridemia or low HDL-C | 158,593 (41.0) | 79,747 (43.8) | 78,846 (38.6) |
| Self-reported dyslipidemia | 72,711 (18.8) | 44,575 (24.5) | 28,136 (13.8) |
| ICD diagnoses | 39,617 (10.2) | 24,390 (13.4) | 15,227 (7.4) |
| **E. Gout** | **55,706 (14.4)** | **36,401 (20.0)** | **19,305 (9.4)** |
| Hyperuricemia | 51,059 (13.2) | 32,190 (17.7) | 18,869 (9.2) |
| Self-reported gout | 6,206 (1.6) | 5,770 (3.2) | 436 (0.21) |
| ICD diagnoses | 4,066 (1.1) | 3,568 (2.0) | 498 (0.24) |

HbA1c, glycated hemoglobin; HDL-C, high-density lipoprotein cholesterol; ICD, International Classification of Diseases; LDL-C, low-density lipoprotein cholesterol; WC, waist circumference.

**Table S10:** Odds ratios of metabolic syndrome (NCEP ATP III criteria) across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Metabolic Syndrome** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 5,317 (25.7) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D2 | 407 (20.4) | 1.11 (0.95, 1.29) | 0.2016 | 1.10 (0.94, 1.29) | 0.2371 | 1.09 (0.93, 1.27) | 0.2979 |
| D2 (13.6-14.1 g/dL) | 387 (18.3) | Reference | - | Reference | - | Reference | - |
| D3 (14.2-14.5 g/dL) vs. D2 | 461 (20.5) | 1.18 (1.02, 1.38) | **0.0307** | 1.17 (1.01, 1.36) | **0.0407** | 1.17 (1.00, 1.36) | **0.0451** |
| D4 (14.6-14.8 g/dL) vs. D2 | 421 (20.8) | 1.22 (1.05, 1.42) | **0.0119** | 1.21 (1.03, 1.41) | **0.0180** | 1.20 (1.03, 1.40) | **0.0221** |
| D5 (14.9-15.1 g/dL) vs. D2 | 541 (23.8) | 1.47 (1.27, 1.71) | **<0.0001** | 1.46 (1.26, 1.69) | **<0.0001** | 1.45 (1.25, 1.68) | **<0.0001** |
| D6 (15.2-15.3 g/dL) vs. D2 | 389 (25.3) | 1.63 (1.39, 1.91) | **<0.0001** | 1.61 (1.37, 1.89) | **<0.0001** | 1.59 (1.36, 1.87) | **<0.0001** |
| D7 (15.4-15.6 g/dL) vs. D2 | 586 (26.7) | 1.78 (1.54, 2.06) | **<0.0001** | 1.75 (1.51, 2.03) | **<0.0001** | 1.74 (1.50, 2.01) | **<0.0001** |
| D8 (15.7-16.0 g/dL) vs. D2 | 695 (28.6) | 1.96 (1.70, 2.26) | **<0.0001** | 1.92 (1.66, 2.22) | **<0.0001** | 1.90 (1.65, 2.20) | **<0.0001** |
| D9 (16.1-16.4 g/dL) vs. D2 | 576 (32.7) | 2.46 (2.12, 2.86) | **<0.0001** | 2.37 (2.04, 2.76) | **<0.0001** | 2.36 (2.02, 2.74) | **<0.0001** |
| D10 (>16.4 g/dL) vs. D2 | 854 (40.7) | 3.44 (2.98, 3.97) | **<0.0001** | 3.22 (2.79, 3.72) | **<0.0001** | 3.17 (2.75, 3.67) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 8,794 (18.9) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) vs. D3 | 576 (12.0) | 1.13 (0.99, 1.28) | 0.0664 | 1.13 (0.99, 1.28) | 0.0627 | 1.11 (0.98, 1.26) | 0.1147 |
| D2 (11.6-12.1 g/dL) vs. D3 | 543 (13.4) | 1.10 (0.97, 1.25) | 0.1471 | 1.10 (0.97, 1.25) | 0.1416 | 1.11 (0.97, 1.26) | 0.1195 |
| D3 (12.2-12.5 g/dL) | 578 (13.0) | Reference | - | Reference | - | Reference | - |
| D4 (12.6-12.8 g/dL) vs. D3 | 618 (13.6) | 1.02 (0.90, 1.16) | 0.7217 | 1.02 (0.90, 1.16) | 0.7283 | 1.03 (0.91, 1.17) | 0.6443 |
| D5 (12.9-13.1 g/dL) vs. D3 | 838 (16.1) | 1.23 (1.09, 1.38) | **0.0006** | 1.23 (1.09, 1.38) | **0.0006** | 1.23 (1.10, 1.39) | **0.0005** |
| D6 (13.2-13.4 g/dL) vs. D3 | 1,051 (18.5) | 1.43 (1.28, 1.60) | **<0.0001** | 1.43 (1.28, 1.60) | **<0.0001** | 1.44 (1.29, 1.61) | **<0.0001** |
| D7 (13.5-13.6 g/dL) vs. D3 | 679 (20.2) | 1.59 (1.40, 1.80) | **<0.0001** | 1.59 (1.40, 1.80) | **<0.0001** | 1.59 (1.41, 1.80) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D3 | 1,063 (22.9) | 1.82 (1.62, 2.03) | **<0.0001** | 1.81 (1.62, 2.03) | **<0.0001** | 1.83 (1.63, 2.05) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D3 | 1,390 (25.1) | 2.05 (1.84, 2.28) | **<0.0001** | 2.04 (1.83, 2.28) | **<0.0001** | 2.06 (1.84, 2.29) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D3 | 1,458 (34.4) | 3.11 (2.79, 3.48) | **<0.0001** | 3.09 (2.76, 3.45) | **<0.0001** | 3.11 (2.78, 3.47) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity and highest educational attainment. ¶In women, menopausal status was included as covariate.

Table S10.1: Odds ratios of metabolic syndrome (Taiwan’s criteria) across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Metabolic Syndrome** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 5,530 (26.8) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D2 | 425 (21.3) | 1.09 (0.93, 1.27) | 0.2846 | 1.08 (0.93, 1.26) | 0.3308 | 1.07 (0.92, 1.25) | 0.4028 |
| D2 (13.6-14.1 g/dL) | 411 (19.5) | Reference | - | Reference | - | Reference | - |
| D3 (14.2-14.5 g/dL) vs. D2 | 475 (21.1) | 1.14 (0.98, 1.32) | 0.0898 | 1.13 (0.97, 1.31) | 0.1149 | 1.12 (0.97, 1.31) | 0.1251 |
| D4 (14.6-14.8 g/dL) vs. D2 | 434 (21.4) | 1.17 (1.01, 1.37) | **0.0390** | 1.16 (1.00, 1.35) | 0.0557 | 1.16 (0.99, 1.35) | 0.0658 |
| D5 (14.9-15.1 g/dL) vs. D2 | 558 (24.6) | 1.42 (1.23, 1.64) | **<0.0001** | 1.41 (1.22, 1.63) | **<0.0001** | 1.40 (1.21, 1.62) | **<0.0001** |
| D6 (15.2-15.3 g/dL) vs. D2 | 411 (26.8) | 1.62 (1.39, 1.90) | **<0.0001** | 1.60 (1.37, 1.87) | **<0.0001** | 1.59 (1.36, 1.86) | **<0.0001** |
| D7 (15.4-15.6 g/dL) vs. D2 | 621 (28.3) | 1.78 (1.54, 2.05) | **<0.0001** | 1.75 (1.52, 2.03) | **<0.0001** | 1.74 (1.50, 2.01) | **<0.0001** |
| D8 (15.7-16.0 g/dL) vs. D2 | 720 (29.6) | 1.90 (1.65, 2.19) | **<0.0001** | 1.86 (1.62, 2.15) | **<0.0001** | 1.85 (1.61, 2.13) | **<0.0001** |
| D9 (16.1-16.4 g/dL) vs. D2 | 593 (33.7) | 2.37 (2.04, 2.75) | **<0.0001** | 2.29 (1.97, 2.66) | **<0.0001** | 2.27 (1.96, 2.64) | **<0.0001** |
| D10 (>16.4 g/dL) vs. D2 | 882 (42.0) | 3.36 (2.92, 3.86) | **<0.0001** | 3.14 (2.73, 3.62) | **<0.0001** | 3.10 (2.69, 3.57) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 8,823 (19.0) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) | 582 (12.1) | 1.13 (1.00, 1.29) | 0.0517 | 1.14 (1.001, 1.29) | **0.0487** | 1.12 (0.98, 1.27) | 0.0919 |
| D2 (11.6-12.1 g/dL) vs. D1 | 545 (13.5) | 1.10 (0.97, 1.25) | 0.1467 | 1.10 (0.97, 1.25) | 0.1413 | 1.11 (0.97, 1.26) | 0.1191 |
| D3 (12.2-12.5 g/dL) vs. D1 | 580 (13.0) | Reference | - | Reference | - | Reference | - |
| D4 (12.6-12.8 g/dL) vs. D1 | 620 (13.6) | 1.02 (0.90, 1.16) | 0.7231 | 1.02 (0.90, 1.16) | 0.7298 | 1.03 (0.91, 1.17) | 0.6461 |
| D5 (12.9-13.1 g/dL) vs. D1 | 839 (16.1) | 1.22 (1.09, 1.37) | **0.0007** | 1.22 (1.09, 1.38) | **0.0007** | 1.23 (1.09, 1.38) | **0.0005** |
| D6 (13.2-13.4 g/dL) vs. D1 | 1,056 (18.5) | 1.43 (1.28, 1.60) | **<0.0001** | 1.43 (1.28, 1.60) | **<0.0001** | 1.44 (1.29, 1.61) | **<0.0001** |
| D7 (13.5-13.6 g/dL) vs. D1 | 681 (20.2) | 1.59 (1.40, 1.80) | **<0.0001** | 1.59 (1.40, 1.80) | **<0.0001** | 1.59 (1.41, 1.80) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D1 | 1,067 (23.0) | 1.82 (1.62, 2.04) | **<0.0001** | 1.81 (1.62, 2.03) | **<0.0001** | 1.83 (1.64, 2.05) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D1 | 1,394 (25.2) | 2.05 (1.84, 2.28) | **<0.0001** | 2.04 (1.83, 2.28) | **<0.0001** | 2.06 (1.84, 2.29) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D1 | 1,459 (34.4) | 3.11 (2.78, 3.47) | **<0.0001** | 3.08 (2.76, 3.44) | **<0.0001** | 3.10 (2.77, 3.46) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity and highest educational attainment. ¶In women, menopausal status was included as covariate.

**Table S11:** Odds ratios of metabolic syndrome (NCEP ATP III criteria) across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Metabolic Syndrome** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 89,330 (49.0) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) vs. D2 | 8,178 (46.3) | 1.04 (1.001, 1.09) | **0.0431** | 1.03 (0.99, 1.08) | 0.1622 | 0.99 (0.95, 1.04) | 0.7693 |
| D2 (13.80-14.24 g/dL) | 8,173 (43.8) | Reference | - | Reference | - | Reference | - |
| D3 (14.25-14.54 g/dL) vs. D2 | 8,178 (44.5) | 1.06 (1.02, 1.11) | **0.0041** | 1.07 (1.03, 1.12) | **0.0012** | 1.08 (1.03, 1.13) | **0.0014** |
| D4 (14.55-14.80 g/dL) vs. D2 | 9,022 (46.0) | 1.13 (1.09, 1.18) | **<0.0001** | 1.14 (1.10, 1.19) | **<0.0001** | 1.13 (1.08, 1.19) | **<0.0001** |
| D5 (14.81-15.02 g/dL) vs. D2 | 7,954 (48.1) | 1.26 (1.21, 1.32) | **<0.0001** | 1.28 (1.23, 1.33) | **<0.0001** | 1.27 (1.21, 1.33) | **<0.0001** |
| D6 (15.03-15.29 g/dL) vs. D2 | 8,899 (48.9) | 1.31 (1.25, 1.36) | **<0.0001** | 1.33 (1.27, 1.38) | **<0.0001** | 1.30 (1.24, 1.36) | **<0.0001** |
| D7 (15.30-15.51 g/dL) vs. D2 | 9,055 (49.1) | 1.33 (1.27, 1.38) | **<0.0001** | 1.35 (1.29, 1.40) | **<0.0001** | 1.33 (1.27, 1.39) | **<0.0001** |
| D8 (15.52-15.81 g/dL) vs. D2 | 9,438 (51.5) | 1.47 (1.41, 1.53) | **<0.0001** | 1.50 (1.44, 1.56) | **<0.0001** | 1.47 (1.40, 1.53) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D2 | 9,748 (54.1) | 1.65 (1.58, 1.72) | **<0.0001** | 1.68 (1.61, 1.75) | **<0.0001** | 1.63 (1.55, 1.70) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D2 | 10,685 (58.4) | 1.94 (1.87, 2.03) | **<0.0001** | 1.98 (1.90, 2.06) | **<0.0001** | 1.89 (1.80, 1.98) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 76,714 (37.5) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D2 | 6,124 (30.0) | 1.07 (1.03, 1.12) | **0.0017** | 1.04 (0.99, 1.09) | 0.0899 | 1.00 (0.95, 1.05) | 0.9514 |
| D2 (12.40-12.79 g/dL) | 5,871 (29.8) | Reference | - | Reference | - | Reference | - |
| D3 (12.80-13.09 g/dL) vs. D2 | 6,618 (31.1) | 1.04 (0.997, 1.09) | 0.0672 | 1.05 (1.001, 1.09) | **0.0454** | 1.04 (0.99, 1.10) | 0.1255 |
| D4 (13.10-13.30 g/dL) vs. D2 | 6,937 (33.1) | 1.12 (1.08, 1.17) | **<0.0001** | 1.13 (1.08, 1.18) | **<0.0001** | 1.13 (1.08, 1.19) | **<0.0001** |
| D5 (13.31-13.52 g/dL) vs. D2 | 6,872 (34.8) | 1.20 (1.15, 1.25) | **<0.0001** | 1.21 (1.16, 1.27) | **<0.0001** | 1.20 (1.14, 1.27) | **<0.0001** |
| D6 (13.53-13.75 g/dL) vs. D2 | 7,474 (36.6) | 1.29 (1.23, 1.34) | **<0.0001** | 1.30 (1.25, 1.36) | **<0.0001** | 1.30 (1.23, 1.36) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D2 | 7,873 (39.4) | 1.44 (1.38, 1.50) | **<0.0001** | 1.46 (1.40, 1.52) | **<0.0001** | 1.45 (1.38, 1.52) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D2 | 8,901 (41.8) | 1.58 (1.52, 1.65) | **<0.0001** | 1.60 (1.54, 1.67) | **<0.0001** | 1.60 (1.53, 1.68) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D2 | 9,281 (45.4) | 1.79 (1.71, 1.87) | **<0.0001** | 1.80 (1.73, 1.88) | **<0.0001** | 1.81 (1.72, 1.90) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D2 | 10,763 (53.0) | 2.36 (2.26, 2.46) | **<0.0001** | 2.34 (2.24, 2.44) | **<0.0001** | 2.35 (2.24, 2.47) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity and highest educational attainment. ¶In women, menopausal status was included as covariate.

**Table S12:** Odds ratios of central obesity across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Central Obesity** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 7,802 (37.8) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) | 596 (29.8) | Reference | - | Reference | - | Reference | - |
| D2 (13.6-14.1 g/dL) vs. D1 | 637 (30.2) | 1.02 (0.89, 1.17) | 0.7600 | 1.03 (0.90, 1.18) | 0.6875 | 1.12 (0.98, 1.29) | 0.1081 |
| D3 (14.2-14.5 g/dL) vs. D1 | 762 (33.9) | 1.22 (1.07, 1.39) | **0.0031** | 1.22 (1.07, 1.39) | **0.0029** | 1.32 (1.15, 1.51) | **<0.0001** |
| D4 (14.6-14.8 g/dL) vs. D1 | 676 (33.4) | 1.19 (1.05, 1.36) | **0.0093** | 1.20 (1.05, 1.37) | **0.0087** | 1.26 (1.10, 1.46) | **0.0011** |
| D5 (14.9-15.1 g/dL) vs. D1 | 812 (35.8) | 1.33 (1.17, 1.51) | **<0.0001** | 1.33 (1.17, 1.52) | **<0.0001** | 1.38 (1.20, 1.58) | **<0.0001** |
| D6 (15.2-15.3 g/dL) vs. D1 | 594 (38.7) | 1.51 (1.31, 1.74) | **<0.0001** | 1.51 (1.31, 1.74) | **<0.0001** | 1.57 (1.35, 1.82) | **<0.0001** |
| D7 (15.4-15.6 g/dL) vs. D1 | 870 (39.7) | 1.58 (1.39, 1.80) | **<0.0001** | 1.58 (1.39, 1.80) | **<0.0001** | 1.58 (1.38, 1.81) | **<0.0001** |
| D8 (15.7-16.0 g/dL) vs. D1 | 1,011 (41.6) | 1.71 (1.51, 1.94) | **<0.0001** | 1.70 (1.50, 1.93) | **<0.0001** | 1.68 (1.47, 1.92) | **<0.0001** |
| D9 (16.1-16.4 g/dL) vs. D1 | 777 (44.1) | 1.90 (1.66, 2.18) | **<0.0001** | 1.88 (1.64, 2.16) | **<0.0001** | 1.78 (1.54, 2.05) | **<0.0001** |
| D10 (>16.4 g/dL) vs. D1 | 1,067 (50.8) | 2.48 (2.18, 2.83) | **<0.0001** | 2.40 (2.11, 2.74) | **<0.0001** | 2.03 (1.77, 2.33) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 22,310 (47.9) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) | 1,932 (40.2) | Reference | - | Reference | - | Reference | - |
| D2 (11.6-12.1 g/dL) vs. D1 | 1,661 (41.1) | 0.96 (0.88, 1.05) | 0.3621 | 0.96 (0.88, 1.05) | 0.3691 | 1.01 (0.93, 1.11) | 0.7629 |
| D3 (12.2-12.5 g/dL) vs. D1 | 1,846 (41.4) | 0.95 (0.87, 1.03) | 0.1993 | 0.94 (0.87, 1.03) | 0.1846 | 1.01 (0.92, 1.10) | 0.8560 |
| D4 (12.6-12.8 g/dL) vs. D1 | 1,979 (43.4) | 1.01 (0.93, 1.10) | 0.7723 | 1.01 (0.93, 1.10) | 0.8125 | 1.06 (0.98, 1.16) | 0.1608 |
| D5 (12.9-13.1 g/dL) vs. D1 | 2,339 (44.9) | 1.06 (0.98, 1.15) | 0.1465 | 1.06 (0.98, 1.15) | 0.1636 | 1.11 (1.02, 1.21) | **0.0179** |
| D6 (13.2-13.4 g/dL) vs. D1 | 2,737 (48.0) | 1.20 (1.11, 1.30) | **<0.0001** | 1.20 (1.11, 1.30) | **<0.0001** | 1.22 (1.13, 1.33) | **<0.0001** |
| D7 (13.5-13.6 g/dL) vs. D1 | 1,705 (50.6) | 1.33 (1.21, 1.45) | **<0.0001** | 1.32 (1.21, 1.45) | **<0.0001** | 1.32 (1.20, 1.45) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D1 | 2,403 (51.7) | 1.36 (1.25, 1.48) | **<0.0001** | 1.36 (1.25, 1.47) | **<0.0001** | 1.33 (1.22, 1.45) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D1 | 3,074 (55.6) | 1.59 (1.47, 1.72) | **<0.0001** | 1.58 (1.46, 1.72) | **<0.0001** | 1.49 (1.37, 1.62) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D1 | 2,634 (62.1) | 2.04 (1.87, 2.22) | **<0.0001** | 2.03 (1.86, 2.22) | **<0.0001** | 1.72 (1.57, 1.89) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

**Table S13:** Odds ratios of central obesity across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Central Obesity** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 101,772 (55.9) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) | 8,552 (48.7) | Reference | - | Reference | - | Reference | - |
| D2 (13.80-14.24 g/dL) vs. D1 | 9,297 (48.9) | 1.04 (1.00, 1.09) | **0.0444** | 1.05 (1.01, 1.10) | **0.0173** | 1.17 (1.11, 1.22) | **<0.0001** |
| D3 (14.25-14.54 g/dL) vs. D1 | 9,213 (51.0) | 1.15 (1.10, 1.20) | **<0.0001** | 1.17 (1.12, 1.22) | **<0.0001** | 1.28 (1.22, 1.34) | **<0.0001** |
| D4 (14.55-14.80 g/dL) vs. D1 | 10,441 (53.2) | 1.26 (1.21, 1.32) | **<0.0001** | 1.29 (1.23, 1.34) | **<0.0001** | 1.41 (1.34, 1.48) | **<0.0001** |
| D5 (14.81-15.02 g/dL) vs. D1 | 9,197 (55.6) | 1.41 (1.35, 1.47) | **<0.0001** | 1.44 (1.38, 1.51) | **<0.0001** | 1.55 (1.47, 1.63) | **<0.0001** |
| D6 (15.03-15.29 g/dL) vs. D1 | 10,480 (56.2) | 1.44 (1.38, 1.50) | **<0.0001** | 1.48 (1.42, 1.54) | **<0.0001** | 1.58 (1.50, 1.65) | **<0.0001** |
| D7 (15.30-15.51 g/dL) vs. D1 | 10,374 (57.8) | 1.55 (1.49, 1.62) | **<0.0001** | 1.60 (1.53, 1.66) | **<0.0001** | 1.69 (1.61, 1.77) | **<0.0001** |
| D8 (15.52-15.81 g/dL) vs. D1 | 10,935 (59.7) | 1.68 (1.61, 1.75) | **<0.0001** | 1.74 (1.66, 1.81) | **<0.0001** | 1.78 (1.69, 1.87) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D1 | 11,161 (61.9) | 1.85 (1.77, 1.93) | **<0.0001** | 1.92 (1.84, 2.00) | **<0.0001** | 1.90 (1.81, 2.00) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D1 | 12,122 (66.3) | 2.22 (2.13, 2.32) | **<0.0001** | 2.32 (2.22, 2.42) | **<0.0001** | 2.21 (2.11, 2.33) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 117,475 (57.5) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) | 9,811 (48.4) | Reference | - | Reference | - | Reference | - |
| D2 (12.40-12.79 g/dL) vs. D1 | 9,743 (49.4) | 1.01 (0.97, 1.05) | 0.6505 | 1.03 (0.99, 1.07) | 0.1371 | 1.07 (1.02, 1.13) | **0.0033** |
| D3 (12.80-13.09 g/dL) vs. D1 | 11,073 (52.0) | 1.11 (1.06, 1.15) | **<0.0001** | 1.13 (1.09, 1.18) | **<0.0001** | 1.17 (1.12, 1.23) | **<0.0001** |
| D4 (13.10-13.30 g/dL) vs. D1 | 11,212 (53.4) | 1.16 (1.12, 1.21) | **<0.0001** | 1.20 (1.15, 1.24) | **<0.0001** | 1.21 (1.16, 1.27) | **<0.0001** |
| D5 (13.31-13.52 g/dL) vs. D1 | 10,982 (55.6) | 1.26 (1.21, 1.31) | **<0.0001** | 1.30 (1.24, 1.35) | **<0.0001** | 1.30 (1.24, 1.36) | **<0.0001** |
| D6 (13.53-13.75 g/dL) vs. D1 | 11,715 (57.4) | 1.35 (1.29, 1.40) | **<0.0001** | 1.39 (1.34, 1.45) | **<0.0001** | 1.40 (1.33, 1.47) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D1 | 12,002 (60.1) | 1.49 (1.43, 1.55) | **<0.0001** | 1.54 (1.48, 1.61) | **<0.0001** | 1.50 (1.43, 1.57) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D1 | 13,223 (62.1) | 1.61 (1.55, 1.68) | **<0.0001** | 1.67 (1.62, 1.74) | **<0.0001** | 1.60 (1.53, 1.68) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D1 | 13,394 (65.5) | 1.84 (1.77, 1.92) | **<0.0001** | 1.91 (1.83, 1.99) | **<0.0001** | 1.76 (1.68, 1.85) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D1 | 14,320 (70.5) | 2.27 (2.18, 2.36) | **<0.0001** | 2.35 (2.25, 2.45) | **<0.0001** | 2.00 (1.91, 2.11) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

**Table S14:** Odds ratios of hypertension†† across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Hypertension** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 7,076 (34.2) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D2 | 712 (35.7) | 1.07 (0.94, 1.23) | 0.3115 | 1.07 (0.94, 1.23) | 0.3060 | 1.03 (0.90, 1.19) | 0.6604 |
| D2 (13.6-14.1 g/dL) | 679 (32.2) | Reference | - | Reference | - | Reference | - |
| D3 (14.2-14.5 g/dL) vs. D2 | 711 (31.6) | 1.05 (0.92, 1.20) | 0.4959 | 1.05 (0.92, 1.20) | 0.4719 | 1.05 (0.91, 1.20) | 0.5306 |
| D4 (14.6-14.8 g/dL) vs. D2 | 658 (32.5) | 1.15 (1.001, 1.32) | **0.0479** | 1.15 (1.001, 1.32) | **0.0489** | 1.14 (0.99, 1.32) | 0.0620 |
| D5 (14.9-15.1 g/dL) vs. D2 | 744 (32.8) | 1.18 (1.04, 1.35) | **0.0131** | 1.18 (1.03, 1.35) | **0.0150** | 1.16 (1.01, 1.33) | **0.0348** |
| D6 (15.2-15.3 g/dL) vs. D2 | 497 (32.4) | 1.24 (1.07, 1.44) | **0.0040** | 1.24 (1.07, 1.44) | **0.0052** | 1.23 (1.05, 1.43) | **0.0085** |
| D7 (15.4-15.6 g/dL) vs. D2 | 733 (33.4) | 1.35 (1.18, 1.55) | **<0.0001** | 1.35 (1.18, 1.55) | **<0.0001** | 1.30 (1.13, 1.49) | **0.0002** |
| D8 (15.7-16.0 g/dL) vs. D2 | 844 (34.7) | 1.46 (1.28, 1.67) | **<0.0001** | 1.46 (1.28, 1.67) | **<0.0001** | 1.40 (1.23, 1.60) | **<0.0001** |
| D9 (16.1-16.4 g/dL) vs. D2 | 609 (34.6) | 1.58 (1.37, 1.82) | **<0.0001** | 1.56 (1.35, 1.80) | **<0.0001** | 1.46 (1.26, 1.69) | **<0.0001** |
| D10 (>16.4 g/dL) vs. D2 | 889 (42.4) | 2.21 (1.94, 2.53) | **<0.0001** | 2.19 (1.91, 2.51) | **<0.0001** | 1.95 (1.70, 2.24) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 9,002 (19.3) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) vs. D3 | 560 (11.7) | 1.11 (0.98, 1.27) | 0.0988 | 1.11 (0.98, 1.27) | 0.1004 | 1.07 (0.94, 1.22) | 0.2944 |
| D2 (11.6-12.1 g/dL) vs. D3 | 573 (14.2) | 1.06 (0.93, 1.21) | 0.3640 | 1.06 (0.93, 1.21) | 0.3596 | 1.06 (0.93, 1.21) | 0.3669 |
| D3 (12.2-12.5 g/dL) | 647 (14.5) | Reference | - | Reference | - | Reference | - |
| D4 (12.6-12.8 g/dL) vs. D3 | 756 (16.6) | 1.13 (1.002, 1.27) | **0.0468** | 1.13 (1.002, 1.27) | **0.0475** | 1.15 (1.02, 1.30) | **0.0272** |
| D5 (12.9-13.1 g/dL) vs. D3 | 901 (17.3) | 1.14 (1.02, 1.28) | **0.0231** | 1.14 (1.02, 1.28) | **0.0241** | 1.15 (1.02, 1.30) | **0.0198** |
| D6 (13.2-13.4 g/dL) vs. D3 | 1,076 (18.9) | 1.25 (1.12, 1.40) | **<0.0001** | 1.25 (1.12, 1.40) | **<0.0001** | 1.25 (1.12, 1.40) | **0.0001** |
| D7 (13.5-13.6 g/dL) vs. D3 | 695 (20.6) | 1.40 (1.23, 1.58) | **<0.0001** | 1.40 (1.23, 1.58) | **<0.0001** | 1.37 (1.21, 1.56) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D3 | 1,066 (22.9) | 1.53 (1.36, 1.71) | **<0.0001** | 1.53 (1.36, 1.71) | **<0.0001** | 1.50 (1.34, 1.69) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D3 | 1,378 (24.9) | 1.71 (1.53, 1.90) | **<0.0001** | 1.71 (1.53, 1.90) | **<0.0001** | 1.63 (1.46, 1.82) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D3 | 1,350 (31.8) | 2.33 (2.09, 2.61) | **<0.0001** | 2.34 (2.09, 2.62) | **<0.0001** | 2.12 (1.89, 2.39) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Based on Taiwan Society of Cardiology and Taiwan Hypertension Society classification of hypertension.

**Table S15:** Odds ratios of hypertension†† across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Hypertension** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 116,701 (64.1) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) | 11,243 (64.1) | Reference | - | Reference | - | Reference | - |
| D2 (13.80-14.24 g/dL) vs. D1 | 11,461 (60.3) | 0.94 (0.90, 0.98) | **0.0054** | 0.94 (0.90, 0.99) | **0.0091** | 1.01 (0.97, 1.07) | 0.5851 |
| D3 (14.25-14.54 g/dL) vs. D1 | 10,882 (60.2) | 0.98 (0.93, 1.01) | 0.2729 | 0.98 (0.94, 1.03) | 0.4121 | 1.06 (1.01, 1.12) | **0.0152** |
| D4 (14.55-14.80 g/dL) vs. D1 | 12,026 (61.3) | 1.04 (0.99, 1.08) | 0.1225 | 1.04 (0.998, 1.09) | 0.0595 | 1.11 (1.05, 1.16) | **<0.0001** |
| D5 (14.81-15.02 g/dL) vs. D1 | 10,249 (62.0) | 1.11 (1.06, 1.16) | **<0.0001** | 1.12 (1.07, 1.17) | **<0.0001** | 1.20 (1.14, 1.26) | **<0.0001** |
| D6 (15.03-15.29 g/dL) vs. D1 | 11,898 (63.8) | 1.20 (1.15, 1.25) | **<0.0001** | 1.21 (1.16, 1.27) | **<0.0001** | 1.28 (1.22, 1.34) | **<0.0001** |
| D7 (15.30-15.51 g/dL) vs. D1 | 11,345 (63.2) | 1.20 (1.14, 1.25) | **<0.0001** | 1.21 (1.16, 1.27) | **<0.0001** | 1.27 (1.21, 1.34) | **<0.0001** |
| D8 (15.52-15.81 g/dL) vs. D1 | 11,977 (65.4) | 1.33 (1.27, 1.39) | **<0.0001** | 1.35 (1.29, 1.41) | **<0.0001** | 1.40 (1.33, 1.48) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D1 | 12,287 (68.2) | 1.53 (1.46, 1.60) | **<0.0001** | 1.55 (1.48, 1.62) | **<0.0001** | 1.61 (1.53, 1.69) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D1 | 13,333 (72.9) | 1.91 (1.82, 2.00) | **<0.0001** | 1.95 (1.86, 2.04) | **<0.0001** | 1.99 (1.89, 2.10) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 102,058 (49.9) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D2 | 8,365 (41.3) | 1.07 (1.03, 1.12) | **0.0016** | 1.06 (1.01, 1.10) | **0.0112** | 1.02 (0.97, 1.07) | 0.4327 |
| D2 (12.40-12.79 g/dL) | 8,228 (41.7) | Reference | - | Reference | - | Reference | - |
| D3 (12.80-13.09 g/dL) vs. D2 | 9,245 (43.4) | 1.04 (0.998, 1.08) | 0.0650 | 1.04 (0.999, 1.09) | 0.0571 | 1.03 (0.98, 1.08) | 0.2840 |
| D4 (13.10-13.30 g/dL) vs. D2 | 9,570 (45.6) | 1.12 (1.07, 1.17) | **<0.0001** | 1.13 (1.08, 1.17) | **<0.0001** | 1.12 (1.07, 1.17) | **<0.0001** |
| D5 (13.31-13.52 g/dL) vs. D2 | 9,406 (47.6) | 1.18 (1.13, 1.23) | **<0.0001** | 1.19 (1.14, 1.24) | **<0.0001** | 1.19 (1.13, 1.25) | **<0.0001** |
| D6 (13.53-13.75 g/dL) vs. D2 | 10,002 (49.0) | 1.24 (1.19, 1.29) | **<0.0001** | 1.25 (1.20, 1.30) | **<0.0001** | 1.24 (1.18, 1.30) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D2 | 10,264 (51.4) | 1.34 (1.28, 1.40) | **<0.0001** | 1.35 (1.30, 1.41) | **<0.0001** | 1.33 (1.27, 1.40) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D2 | 11,573 (54.4) | 1.50 (1.44, 1.56) | **<0.0001** | 1.52 (1.45, 1.58) | **<0.0001** | 1.49 (1.42, 1.56) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D2 | 12,018 (58.9) | 1.75 (1.68, 1.82) | **<0.0001** | 1.77 (1.70, 1.85) | **<0.0001** | 1.70 (1.62, 1.78) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D2 | 13,387 (65.9) | 2.31 (2.21, 2.41) | **<0.0001** | 2.35 (2.25, 2.45) | **<0.0001** | 2.22 (2.11, 2.33) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Based on European Society of Cardiology/National Institute for Health and Care Excellence classification of hypertension.

**Table S16:** Odds ratios of dyslipidemia†† across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Dyslipidemia** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 9,066 (43.9) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D2 | 796 (39.9) | 1.20 (1.06, 1.36) | **0.0053** | 1.19 (1.04, 1.35) | **0.0087** | 1.14 (1.002, 1.30) | **0.0458** |
| D2 (13.6-14.1 g/dL) | 750 (35.6) | Reference | - | Reference | - | Reference | - |
| D3 (14.2-14.5 g/dL) vs. D2 | 860 (38.2) | 1.13 (1.001, 1.28) | **0.0490** | 1.12 (0.99, 1.27) | 0.0764 | 1.12 (0.99, 1.27) | 0.0792 |
| D4 (14.6-14.8 g/dL) vs. D2 | 798 (39.4) | 1.19 (1.05, 1.35) | **0.0070** | 1.18 (1.04, 1.34) | **0.0123** | 1.17 (1.03, 1.34) | **0.0159** |
| D5 (14.9-15.1 g/dL) vs. D2 | 966 (42.6) | 1.37 (1.21, 1.55) | **<0.0001** | 1.36 (1.20, 1.54) | **<0.0001** | 1.35 (1.19, 1.53) | **<0.0001** |
| D6 (15.2-15.3 g/dL) vs. D2 | 659 (42.9) | 1.39 (1.21, 1.59) | **<0.0001** | 1.37 (1.19, 1.57) | **<0.0001** | 1.36 (1.19, 1.57) | **<0.0001** |
| D7 (15.4-15.6 g/dL) vs. D2 | 994 (45.4) | 1.55 (1.37, 1.75) | **<0.0001** | 1.53 (1.35, 1.73) | **<0.0001** | 1.50 (1.32, 1.70) | **<0.0001** |
| D8 (15.7-16.0 g/dL) vs. D2 | 1,128 (46.4) | 1.61 (1.43, 1.82) | **<0.0001** | 1.58 (1.40, 1.78) | **<0.0001** | 1.53 (1.35, 1.73) | **<0.0001** |
| D9 (16.1-16.4 g/dL) vs. D2 | 894 (50.8) | 1.94 (1.70, 2.21) | **<0.0001** | 1.88 (1.65, 2.14) | **<0.0001** | 1.81 (1.58, 2.06) | **<0.0001** |
| D10 (>16.4 g/dL) vs. D2 | 1,221 (58.2) | 2.60 (2.29, 2.95) | **<0.0001** | 2.44 (2.15, 2.77) | **<0.0001** | 2.20 (1.93, 2.50) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 19,868 (42.7) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) vs. D2 | 1,796 (37.4) | 1.16 (1.07, 1.27) | **0.0007** | 1.16 (1.07, 1.27) | **0.0008** | 1.15 (1.05, 1.25) | **0.0026** |
| D2 (11.6-12.1 g/dL) | 1,459 (36.1) | Reference | - | Reference | - | Reference | - |
| D3 (12.2-12.5 g/dL) vs. D2 | 1,620 (36.3) | 0.97 (0.89, 1.07) | 0.5717 | 0.98 (0.89, 1.07) | 0.5723 | 0.98 (0.90, 1.07) | 0.6688 |
| D4 (12.6-12.8 g/dL) vs. D2 | 1,753 (38.5) | 1.05 (0.96, 1.15) | 0.2776 | 1.05 (0.96, 1.15) | 0.2851 | 1.05 (0.96, 1.15) | 0.2513 |
| D5 (12.9-13.1 g/dL) vs. D2 | 2,091 (40.1) | 1.11 (1.02, 1.21) | **0.0177** | 1.11 (1.02, 1.21) | **0.0177** | 1.12 (1.03, 1.22) | **0.0107** |
| D6 (13.2-13.4 g/dL) vs. D2 | 2,421 (42.5) | 1.21 (1.11, 1.32) | **<0.0001** | 1.21 (1.11, 1.31) | **<0.0001** | 1.21 (1.11, 1.31) | **<0.0001** |
| D7 (13.5-13.6 g/dL) vs. D2 | 1,483 (44.0) | 1.29 (1.17, 1.41) | **<0.0001** | 1.28 (1.17, 1.41) | **<0.0001** | 1.26 (1.14, 1.38) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D2 | 2,132 (45.9) | 1.36 (1.24, 1.48) | **<0.0001** | 1.35 (1.24, 1.48) | **<0.0001** | 1.33 (1.21, 1.45) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D2 | 2,749 (49.7) | 1.57 (1.44, 1.71) | **<0.0001** | 1.56 (1.44, 1.70) | **<0.0001** | 1.50 (1.38, 1.64) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D2 | 2,364 (55.8) | 1.96 (1.79, 2.14) | **<0.0001** | 1.93 (1.77, 2.12) | **<0.0001** | 1.74 (1.59, 1.91) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Described as either hypertriglyceridemia, low levels of HLD-C, or a combination of the two.

**Table S17:** Odds ratios of dyslipidemia†† across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Dyslipidemia** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 128,064 (70.4) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) | 11,993 (68.4) | Reference | - | Reference | - | Reference | - |
| D2 (13.80-14.24 g/dL) vs. D1 | 12,662 (66.7) | 0.97 (0.93, 1.01) | 0.1420 | 0.98 (0.94, 1.02) | 0.3563 | 1.07 (1.01, 1.12) | **0.0134** |
| D3 (14.25-14.54 g/dL) vs. D1 | 12,228 (67.7) | 1.03 (0.99, 1.08) | 0.1728 | 1.05 (1.00, 1.10) | **0.0327** | 1.14 (1.09, 1.20) | **<0.0001** |
| D4 (14.55-14.80 g/dL) vs. D1 | 13,484 (68.7) | 1.09 (1.04, 1.14) | **0.0002** | 1.11 (1.06, 1.16) | **<0.0001** | 1.20 (1.14, 1.26) | **<0.0001** |
| D5 (14.81-15.02 g/dL) vs. D1 | 11,486 (69.5) | 1.14 (1.09, 1.20) | **<0.0001** | 1.17 (1.11, 1.22) | **<0.0001** | 1.25 (1.18, 1.31) | **<0.0001** |
| D6 (15.03-15.29 g/dL) vs. D1 | 13,137 (70.4) | 1.20 (1.14, 1.25) | **<0.0001** | 1.22 (1.17, 1.28) | **<0.0001** | 1.29 (1.23, 1.36) | **<0.0001** |
| D7 (15.30-15.51 g/dL) vs. D1 | 12,764 (71.1) | 1.25 (1.19, 1.31) | **<0.0001** | 1.27 (1.21, 1.33) | **<0.0001** | 1.36 (1.29, 1.43) | **<0.0001** |
| D8 (15.52-15.81 g/dL) vs. D1 | 13,302 (72.6) | 1.35 (1.29, 1.41) | **<0.0001** | 1.37 (1.31, 1.44) | **<0.0001** | 1.45 (1.37, 1.52) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D1 | 13,159 (73.0) | 1.38 (1.32, 1.44) | **<0.0001** | 1.40 (1.34, 1.47) | **<0.0001** | 1.43 (1.35, 1.50) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D1 | 13,849 (75.7) | 1.57 (1.50, 1.65) | **<0.0001** | 1.58 (1.51, 1.66) | **<0.0001** | 1.56 (1.48, 1.64) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 138,861 (67.9) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) | 12,085 (59.6) | Reference | - | Reference | - | Reference | - |
| D2 (12.40-12.79 g/dL) vs. D1 | 12,025 (61.0) | 0.98 (0.94, 1.02) | 0.3765 | 1.00 (0.96, 1.04) | 0.9564 | 1.02 (0.97, 1.07) | 0.3095 |
| D3 (12.80-13.09 g/dL) vs. D1 | 13,473 (63.2) | 1.06 (1.01, 1.10) | **0.0103** | 1.08 (1.03, 1.12) | **0.0004** | 1.11 (1.06, 1.16) | **<0.0001** |
| D4 (13.10-13.30 g/dL) vs. D1 | 13,713 (65.3) | 1.14 (1.09, 1.19) | **<0.0001** | 1.16 (1.12, 1.21) | **<0.0001** | 1.21 (1.16, 1.27) | **<0.0001** |
| D5 (13.31-13.52 g/dL) vs. D1 | 13,086 (66.3) | 1.16 (1.11, 1.21) | **<0.0001** | 1.18 (1.13, 1.24) | **<0.0001** | 1.19 (1.14, 1.25) | **<0.0001** |
| D6 (13.53-13.75 g/dL) vs. D1 | 13,933 (68.3) | 1.26 (1.21, 1.32) | **<0.0001** | 1.29 (1.24, 1.35) | **<0.0001** | 1.30 (1.24, 1.36) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D1 | 14,010 (70.2) | 1.35 (1.30, 1.41) | **<0.0001** | 1.38 (1.32, 1.44) | **<0.0001** | 1.38 (1.31, 1.45) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D1 | 15,329 (72.0) | 1.47 (1.41, 1.53) | **<0.0001** | 1.49 (1.43, 1.55) | **<0.0001** | 1.49 (1.42, 1.57) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D1 | 15,184 (74.3) | 1.60 (1.53, 1.67) | **<0.0001** | 1.61 (1.54, 1.68) | **<0.0001** | 1.56 (1.49, 1.64) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D1 | 16,023 (78.9) | 2.00 (1.91, 2.09) | **<0.0001** | 1.96 (1.87, 2.05) | **<0.0001** | 1.83 (1.74, 1.93) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Described as either hypertriglyceridemia, low levels of HLD-C, or a combination of the two.

**Table S18:** Odds ratios of hypercholesterolemia†† across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Hypercholesterolemia** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 4,359 (21.1) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) | 343 (17.2) | Reference | - | Reference | - | Reference | - |
| D2 (13.6-14.1 g/dL) vs. D1 | 347 (16.5) | 0.97 (0.82, 1.15) | 0.7292 | 0.98 (0.83, 1.15) | 0.7756 | 1.01 (0.85, 1.19) | 0.9320 |
| D3 (14.2-14.5 g/dL) vs. D1 | 427 (19.0) | 1.18 (1.01, 1.38) | **0.0392** | 1.18 (1.01, 1.39) | **0.0376** | 1.22 (1.04, 1.44) | **0.0135** |
| D4 (14.6-14.8 g/dL) vs. D1 | 405 (20.0) | 1.27 (1.08, 1.49) | **0.0034** | 1.27 (1.09, 1.50) | **0.0032** | 1.31 (1.12, 1.55) | **0.0010** |
| D5 (14.9-15.1 g/dL) vs. D1 | 467 (20.6) | 1.33 (1.14, 1.56) | **0.0003** | 1.33 (1.14, 1.56) | **0.0003** | 1.37 (1.17, 1.61) | **<0.0001** |
| D6 (15.2-15.3 g/dL) vs. D1 | 327 (21.3) | 1.41 (1.19, 1.67) | **<0.0001** | 1.41 (1.19, 1.67) | **<0.0001** | 1.45 (1.22, 1.72) | **<0.0001** |
| D7 (15.4-15.6 g/dL) vs. D1 | 496 (22.6) | 1.55 (1.33, 1.81) | **<0.0001** | 1.55 (1.33, 1.81) | **<0.0001** | 1.57 (1.34, 1.84) | **<0.0001** |
| D8 (15.7-16.0 g/dL) vs. D1 | 542 (22.3) | 1.52 (1.30, 1.77) | **<0.0001** | 1.51 (1.30, 1.76) | **<0.0001** | 1.52 (1.30, 1.77) | **<0.0001** |
| D9 (16.1-16.4 g/dL) vs. D1 | 418 (23.7) | 1.69 (1.44, 1.99) | **<0.0001** | 1.68 (1.43, 1.97) | **<0.0001** | 1.67 (1.42, 1.97) | **<0.0001** |
| D10 (>16.4 g/dL) vs. D1 | 587 (28.0) | 2.08 (1.79, 2.42) | **<0.0001** | 2.04 (1.75, 2.38) | **<0.0001** | 1.92 (1.65, 2.25) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 9,361 (20.1) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) | 450 (9.4) | Reference | - | Reference | - | Reference | - |
| D2 (11.6-12.1 g/dL) vs. D1 | 548 (13.6) | 1.26 (1.10, 1.44) | **0.0007** | 1.26 (1.10, 1.44) | **0.0008** | 1.28 (1.12, 1.47) | **0.0004** |
| D3 (12.2-12.5 g/dL) vs. D1 | 676 (15.1) | 1.35 (1.18, 1.53) | **<0.0001** | 1.35 (1.18, 1.53) | **<0.0001** | 1.37 (1.20, 1.56) | **<0.0001** |
| D4 (12.6-12.8 g/dL) vs. D1 | 830 (18.2) | 1.64 (1.44, 1.86) | **<0.0001** | 1.64 (1.44, 1.85) | **<0.0001** | 1.66 (1.46, 1.89) | **<0.0001** |
| D5 (12.9-13.1 g/dL) vs. D1 | 1,034 (19.8) | 1.77 (1.57, 2.00) | **<0.0001** | 1.77 (1.57, 2.00) | **<0.0001** | 1.81 (1.60, 2.04) | **<0.0001** |
| D6 (13.2-13.4 g/dL) vs. D1 | 1,206 (21.2) | 1.87 (1.66, 2.11) | **<0.0001** | 1.87 (1.66, 2.11) | **<0.0001** | 1.90 (1.68, 2.14) | **<0.0001** |
| D7 (13.5-13.6 g/dL) vs. D1 | 737 (21.9) | 1.96 (1.72, 2.23) | **<0.0001** | 1.95 (1.72, 2.23) | **<0.0001** | 1.96 (1.72, 2.23) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D1 | 1,122 (24.1) | 2.14 (1.89, 2.41) | **<0.0001** | 2.13 (1.89, 2.41) | **<0.0001** | 2.14 (1.89, 2.41) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D1 | 1,448 (26.2) | 2.36 (2.10, 2.65) | **<0.0001** | 2.35 (2.09, 2.64) | **<0.0001** | 2.32 (2.06, 2.61) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D1 | 1,310 (30.9) | 2.85 (2.53, 3.22) | **<0.0001** | 2.83 (2.51, 3.19) | **<0.0001** | 2.67 (2.37, 3.02) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Described as either hypercholesterolemia, high levels of LDL-C, or a combination of the two.

**Table S19:** Odds ratios of hypercholesterolemia†† across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Hypercholesterolemia** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 93,741 (51.5) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) vs. D2 | 9,152 (52.2) | 1.14 (1.09, 1.19) | **<0.0001** | 1.12 (1.07, 1.17) | **<0.0001** | 1.03 (0.98, 1.08) | 0.2360 |
| D2 (13.80-14.24 g/dL) | 9,439 (49.7) | Reference | - | Reference | - | Reference | - |
| D3 (14.25-14.54 g/dL) vs. D2 | 9,068 (50.2) | 1.10 (0.97, 1.05) | 0.6845 | 1.02 (0.97, 1.06) | 0.4765 | 1.02 (0.98, 1.07) | 0.3642 |
| D4 (14.55-14.80 g/dL) vs. D2 | 9,889 (50.4) | 1.06 (1.02, 1.10) | **0.0052** | 1.07 (1.02, 1.11) | **0.0019** | 1.07 (1.02, 1.12) | **0.0045** |
| D5 (14.81-15.02 g/dL) vs. D2 | 8,403 (50.8) | 1.08 (1.03, 1.12) | **0.0006** | 1.09 (1.04, 1.14) | **0.0001** | 1.08 (1.03, 1.13) | **0.0029** |
| D6 (15.03-15.29 g/dL) vs. D2 | 9,716 (52.1) | 1.09 (1.05, 1.14) | **<0.0001** | 1.10 (1.06, 1.15) | **<0.0001** | 1.07 (1.03, 1.13) | **0.0026** |
| D7 (15.30-15.51 g/dL) vs. D2 | 9,240 (51.5) | 1.13 (1.08, 1.18) | **<0.0001** | 1.14 (1.09, 1.18) | **<0.0001** | 1.10 (1.05, 1.16) | **<0.0001** |
| D8 (15.52-15.81 g/dL) vs. D2 | 9,586 (52.3) | 1.20 (1.15, 1.25) | **<0.0001** | 1.20 (1.15, 1.25) | **<0.0001** | 1.17 (1.11, 1.22) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D2 | 9,470 (52.6) | 1.26 (1.21, 1.31) | **<0.0001** | 1.26 (1.21, 1.32) | **<0.0001** | 1.18 (1.12, 1.23) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D2 | 9,778 (53.5) | 1.41 (1.35, 1.47) | **<0.0001** | 1.39 (1.33, 1.45) | **<0.0001** | 1.23 (1.18, 1.29) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 100,585 (49.2) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D2 | 7,622 (37.6) | 1.13 (1.09, 1.18) | **<0.0001** | 1.10 (1.06, 1.14) | **<0.0001** | 1.04 (0.99, 1.09) | 0.0958 |
| D2 (12.40-12.79 g/dL) | 8,153 (41.3) | Reference | - | Reference | - | Reference | - |
| D3 (12.80-13.09 g/dL) vs. D2 | 9,320 (43.7) | 1.03 (0.99, 1.07) | 0.1168 | 1.04 (0.996, 1.08) | 0.0778 | 1.04 (0.99, 1.09) | 0.0856 |
| D4 (13.10-13.30 g/dL) vs. D2 | 9,874 (47.0) | 1.04 (0.999, 1.08) | 0.0534 | 1.04 (1.00, 1.09) | **0.0360** | 1.05 (1.00, 1.10) | 0.0524 |
| D5 (13.31-13.52 g/dL) vs. D2 | 9,479 (48.0) | 1.03 (0.99, 1.07) | 0.1465 | 1.04 (0.995, 1.08) | 0.0847 | 1.01 (0.96, 1.06) | 0.7501 |
| D6 (13.53-13.75 g/dL) vs. D2 | 10,261 (50.3) | 1.07 (1.03, 1.11) | **0.0012** | 1.07 (1.03, 1.12) | **0.0005** | 1.05 (1.00, 1.10) | **0.0337** |
| D7 (13.76-13.99 g/dL) vs. D2 | 10,458 (52.4) | 1.14 (1.10, 1.19) | **<0.0001** | 1.15 (1.10, 1.19) | **<0.0001** | 1.10 (1.05, 1.15) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D2 | 11,496 (54.0) | 1.21 (1.16, 1.26) | **<0.0001** | 1.20 (1.16, 1.25) | **<0.0001** | 1.16 (1.10, 1.21) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D2 | 11,589 (56.7) | 1.29 (1.24, 1.35) | **<0.0001** | 1.28 (1.23, 1.33) | **<0.0001** | 1.18 (1.13, 1.24) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D2 | 12,333 (60.7) | 1.60 (1.53, 1.66) | **<0.0001** | 1.53 (1.47, 1.59) | **<0.0001** | 1.35 (1.29, 1.42) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Described as either hypercholesterolemia, high levels of LDL-C, or a combination of the two.

**Table S20:** Odds ratios of gout across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Gout** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 6,876 (33.3) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D3 | 646 (32.3) | 1.18 (1.03, 1.34) | **0.0156** | 1.18 (1.03, 1.35) | **0.0139** | 1.18 (1.03, 1.35) | **0.0181** |
| D2 (13.6-14.1 g/dL) vs. D3 | 619 (29.3) | 1.02 (0.89, 1.16) | 0.8008 | 1.02 (0.89, 1.16) | 0.8152 | 1.04 (0.91, 1.19) | 0.5898 |
| D3 (14.2-14.5 g/dL) | 655 (29.1) | Reference | - | Reference | - | Reference | - |
| D4 (14.6-14.8 g/dL) vs. D3 | 599 (29.6) | 1.02 (0.90, 1.17) | 0.7488 | 1.02 (0.90, 1.17) | 0.7537 | 1.00 (0.88, 1.15) | 0.9483 |
| D5 (14.9-15.1 g/dL) vs. D3 | 754 (33.2) | 1.21 (1.07, 1.37) | **0.0034** | 1.21 (1.06, 1.37) | **0.0039** | 1.17 (1.03, 1.33) | **0.0185** |
| D6 (15.2-15.3 g/dL) vs. D3 | 504 (32.8) | 1.18 (1.03, 1.36) | **0.0196** | 1.18 (1.02, 1.35) | **0.0250** | 1.13 (0.98, 1.30) | 0.1014 |
| D7 (15.4-15.6 g/dL) vs. D3 | 760 (34.7) | 1.28 (1.13, 1.45) | **0.0001** | 1.27 (1.12, 1.45) | **0.0002** | 1.20 (1.05, 1.36) | **0.0064** |
| D8 (15.7-16.0 g/dL) vs. D3 | 854 (35.1) | 1.30 (1.15, 1.47) | **<0.0001** | 1.30 (1.15, 1.47) | **<0.0001** | 1.20 (1.06, 1.37) | **0.0043** |
| D9 (16.1-16.4 g/dL) vs. D3 | 645 (36.6) | 1.38 (1.21, 1.58) | **<0.0001** | 1.37 (1.20, 1.56) | **<0.0001** | 1.23 (1.07, 1.40) | **0.0038** |
| D10 (>16.4 g/dL) vs. D3 | 841 (40.1) | 1.61 (1.42, 1.83) | **<0.0001** | 1.58 (1.39, 1.80) | **<0.0001** | 1.33 (1.17, 1.51) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 6,704 (14.4) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) | 396 (8.3) | Reference | - | Reference | - | Reference | - |
| D2 (11.6-12.1 g/dL) vs. D1 | 428 (10.6) | 1.16 (1.00, 1.34) | **0.0499** | 1.16 (1.00, 1.34) | **0.0470** | 1.21 (1.05, 1.41) | **0.0107** |
| D3 (12.2-12.5 g/dL) vs. D1 | 483 (10.8) | 1.14 (0.99, 1.31) | 0.0681 | 1.14 (0.99, 1.31) | 0.0701 | 1.21 (1.05, 1.40) | **0.0090** |
| D4 (12.6-12.8 g/dL) vs. D1 | 503 (11.0) | 1.13 (0.99, 1.30) | 0.0801 | 1.13 (0.98, 1.30) | 0.0955 | 1.18 (1.02, 1.36) | **0.0244** |
| D5 (12.9-13.1 g/dL) vs. D1 | 658 (12.6) | 1.30 (1.14, 1.49) | **0.0001** | 1.30 (1.14, 1.48) | **0.0001** | 1.35 (1.17, 1.54) | **<0.0001** |
| D6 (13.2-13.4 g/dL) vs. D1 | 808 (14.2) | 1.47 (1.29, 1.68) | **<0.0001** | 1.47 (1.29, 1.67) | **<0.0001** | 1.49 (1.31, 1.70) | **<0.0001** |
| D7 (13.5-13.6 g/dL) vs. D1 | 554 (16.5) | 1.75 (1.53, 2.02) | **<0.0001** | 1.75 (1.52, 2.01) | **<0.0001** | 1.74 (1.51, 2.00) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D1 | 773 (16.6) | 1.73 (1.52, 1.97) | **<0.0001** | 1.72 (1.51, 1.97) | **<0.0001** | 1.68 (1.47, 1.92) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D1 | 1,029 (18.6) | 1.97 (1.74, 2.24) | **<0.0001** | 1.96 (1.73, 2.23) | **<0.0001** | 1.83 (1.61, 2.08) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D1 | 1,072 (25.3) | 2.86 (2.52, 3.24) | **<0.0001** | 2.84 (2.50, 3.22) | **<0.0001** | 2.44 (2.15, 2.78) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

**Table S21:** Odds ratios of gout across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Gout** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 36,401 (20.0) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) vs. D3 | 3,549 (20.2) | 1.12 (1.07, 1.18) | **<0.0001** | 1.14 (1.08, 1.20) | **<0.0001** | 1.11 (1.04, 1.17) | **0.0010** |
| D2 (13.80-14.24 g/dL) vs. D3 | 3,474 (18.3) | 1.01 (0.96, 1.06) | 0.7324 | 1.01 (0.96, 1.06) | 0.7989 | 1.01 (0.95, 1.07) | 0.7908 |
| D3 (14.25-14.54 g/dL) | 3,261 (18.0) | Reference | - | Reference | - | Reference | - |
| D4 (14.55-14.80 g/dL) vs. D3 | 3,693 (18.8) | 1.05 (1.001, 1.11) | **0.0465** | 1.05 (0.999, 1.11) | 0.0525 | 1.03 (0.97, 1.09) | 0.4090 |
| D5 (14.81-15.02 g/dL) vs. D3 | 3,193 (19.3) | 1.10 (1.04, 1.16) | **0.0010** | 1.10 (1.05, 1.17) | **0.0004** | 1.08 (1.02, 1.15) | **0.0125** |
| D6 (15.03-15.29 g/dL) vs. D3 | 3,615 (20.1) | 1.13 (1.08, 1.19) | **<0.0001** | 1.14 (1.08, 1.21) | **<0.0001** | 1.09 (1.03, 1.16) | **0.0025** |
| D7 (15.30-15.51 g/dL) vs. D3 | 3,843 (21.0) | 1.16 (1.10, 1.22) | **<0.0001** | 1.17 (1.11, 1.23) | **<0.0001** | 1.12 (1.06, 1.19) | **0.0001** |
| D8 (15.52-15.81 g/dL) vs. D3 | 3,843 (21.0) | 1.22 (1.16, 1.28) | **<0.0001** | 1.24 (1.18, 1.31) | **<0.0001** | 1.16 (1.09, 1.23) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D3 | 3,789 (21.0) | 1.22 (1.16, 1.29) | **<0.0001** | 1.25 (1.19, 1.32) | **<0.0001** | 1.16 (1.10, 1.23) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D3 | 4,280 (23.4) | 1.40 (1.33, 1.47) | **<0.0001** | 1.46 (1.39, 1.54) | **<0.0001** | 1.29 (1.22, 1.37) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 19,305 (9.4) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D3 | 1,567 (7.7) | 1.23 (1.14, 1.32) | **<0.0001** | 1.21 (1.12, 1.30) | **<0.0001** | 1.12 (1.03, 1.23) | **0.0113** |
| D2 (12.40-12.79 g/dL) vs. D3 | 1,330 (6.7) | 1.00 (0.92, 1.08) | 0.9165 | 0.99 (0.92, 1.07) | 0.8654 | 1.01 (0.92, 1.11) | 0.8324 |
| D3 (12.80-13.09 g/dL) | 1,471 (6.9) | Reference | - | Reference | - | Reference | - |
| D4 (13.10-13.30 g/dL) vs. D3 | 1,664 (7.9) | 1.14 (1.06, 1.23) | **0.0003** | 1.15 (1.07, 1.23) | **0.0003** | 1.17 (1.07, 1.27) | **0.0005** |
| D5 (13.31-13.52 g/dL) vs. D3 | 1,642 (8.3) | 1.18 (1.10, 1.27) | **<0.0001** | 1.19 (1.10, 1.28) | **<0.0001** | 1.17 (1.07, 1.27) | **0.0005** |
| D6 (13.53-13.75 g/dL) vs. D3 | 1,823 (8.9) | 1.27 (1.18, 1.36) | **<0.0001** | 1.28 (1.19, 1.38) | **<0.0001** | 1.25 (1.15, 1.36) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D3 | 1,933 (9.7) | 1.36 (1.27, 1.46) | **<0.0001** | 1.38 (1.28, 1.48) | **<0.0001** | 1.30 (1.19, 1.41) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D3 | 2,271 (10.7) | 1.51 (1.40, 1.61) | **<0.0001** | 1.52 (1.42, 1.63) | **<0.0001** | 1.41 (1.30, 1.53) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D3 | 2,490 (12.2) | 1.71 (1.60, 1.83) | **<0.0001** | 1.73 (1.62, 1.85) | **<0.0001** | 1.53 (1.41, 1.66) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D3 | 3,114 (15.3) | 2.17 (2.03, 2.31) | **<0.0001** | 2.21 (2.07, 2.36) | **<0.0001** | 1.84 (1.70, 1.99) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

**Table S22:** Odds ratios of diabetes across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Diabetes** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 2,810 (13.6) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D6 | 386 (19.3) | 1.59 (1.30, 1.95) | **<0.0001** | 1.59 (1.30, 1.95) | **<0.0001** | 1.71 (1.39, 2.10) | **<0.0001** |
| D2 (13.6-14.1 g/dL) vs. D6 | 307 (14.6) | 1.21 (0.98, 1.49) | 0.0710 | 1.23 (1.00, 1.51) | 0.0547 | 1.36 (1.10, 1.68) | **0.0047** |
| D3 (14.2-14.5 g/dL) vs. D6 | 295 (13.1) | 1.14 (0.93, 1.41) | 0.2118 | 1.15 (0.93, 1.41) | 0.2004 | 1.23 (0.99, 1.52) | 0.0602 |
| D4 (14.6-14.8 g/dL) vs. D6 | 239 (11.8) | 1.05 (0.85, 1.30) | 0.6597 | 1.05 (0.84, 1.30) | 0.6795 | 1.09 (0.87, 1.36) | 0.4485 |
| D5 (14.9-15.1 g/dL) vs. D6 | 277 (12.2) | 1.11 (0.90, 1.37) | 0.3462 | 1.11 (0.90, 1.37) | 0.3326 | 1.14 (0.92, 1.41) | 0.2476 |
| D6 (15.2-15.3 g/dL) | 163 (10.6) | Reference | - | Reference | - | Reference | - |
| D7 (15.4-15.6 g/dL) vs. D6 | 259 (11.8) | 1.16 (0.94, 1.43) | 0.1793 | 1.16 (0.93, 1.43) | 0.1851 | 1.13 (0.91, 1.40) | 0.2850 |
| D8 (15.7-16.0 g/dL) vs. D6 | 298 (12.3) | 1.23 (1.00, 1.52) | **0.0492** | 1.22 (0.99, 1.50) | 0.0616 | 1.18 (0.96, 1.46) | 0.1197 |
| D9 (16.1-16.4 g/dL) vs. D6 | 224 (12.7) | 1.38 (1.11, 1.72) | **0.0043** | 1.35 (1.08, 1.69) | **0.0076** | 1.28 (1.02, 1.60) | **0.0341** |
| D10 (>16.4 g/dL) vs. D6 | 362 (17.3) | 1.96 (1.60, 2.41) | **<0.0001** | 1.89 (1.54, 2.32) | **<0.0001** | 1.64 (1.33, 2.02) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 4,065 (8.7) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) vs. D5 | 301 (6.3) | 1.34 (1.14, 1.58) | **0.0005** | 1.34 (1.14, 1.57) | **0.0005** | 1.32 (1.12, 1.56) | **0.0010** |
| D2 (11.6-12.1 g/dL) vs. D5 | 287 (7.1) | 1.18 (1.01, 1.39) | **0.0431** | 1.18 (1.00, 1.39) | **0.0461** | 1.22 (1.03, 1.44) | **0.0218** |
| D3 (12.2-12.5 g/dL) vs. D5 | 319 (7.2) | 1.10 (0.94, 1.29) | 0.2261 | 1.10 (0.94, 1.29) | 0.2332 | 1.16 (0.98, 1.36) | 0.0806 |
| D4 (12.6-12.8 g/dL) vs. D5 | 328 (7.2) | 1.05 (0.90, 1.23) | 0.5092 | 1.06 (0.90, 1.24) | 0.5043 | 1.08 (0.92, 1.27) | 0.3524 |
| D5 (12.9-13.1 g/dL) | 368 (7.1) | Reference | - | Reference | - | Reference | - |
| D6 (13.2-13.4 g/dL) vs. D5 | 452 (7.9) | 1.11 (0.96, 1.29) | 0.1509 | 1.11 (0.96, 1.29) | 0.1491 | 1.10 (0.95, 1.28) | 0.2130 |
| D7 (13.5-13.6 g/dL) vs. D5 | 312 (9.3) | 1.31 (1.12, 1.54) | **0.0009** | 1.31 (1.12, 1.54) | **0.0009** | 1.26 (1.07, 1.49) | **0.0054** |
| D8 (13.7-13.9 g/dL) vs. D5 | 422 (9.1) | 1.22 (1.05, 1.42) | **0.0078** | 1.22 (1.05, 1.42) | **0.0088** | 1.13 (0.97, 1.31) | 0.1201 |
| D9 (14.0-14.4 g/dL) vs. D5 | 605 (10.9) | 1.50 (1.31, 1.73) | **<0.0001** | 1.50 (1.31, 1.72) | **<0.0001** | 1.34 (1.16, 1.54) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D5 | 671 (15.8) | 2.22 (1.94, 2.55) | **<0.0001** | 2.21 (1.93, 2.54) | **<0.0001** | 1.83 (1.59, 2.10) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

**Table S23:** Odds ratios of diabetes across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Diabetes** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 17,180 (9.4) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) vs. D8 | 2,854 (16.3) | 1.94 (1.82, 2.08) | **<0.0001** | 1.86 (1.74, 1.99) | **<0.0001** | 2.10 (1.94, 2.27) | **<0.0001** |
| D2 (13.80-14.24 g/dL) vs. D8 | 1,888 (9.9) | 1.17 (1.09, 1.25) | **<0.0001** | 1.15 (1.07, 1.23) | **0.0002** | 1.32 (1.21, 1.43) | **<0.0001** |
| D3 (14.25-14.54 g/dL) vs. D8 | 1,570 (8.7) | 1.03 (0.96, 1.11) | 0.4328 | 1.03 (0.96, 1.11) | 0.3955 | 1.18 (1.08, 1.29) | **0.0001** |
| D4 (14.55-14.80 g/dL) vs. D8 | 1,647 (8.4) | 1.01 (0.93, 1.08) | 0.9648 | 1.00 (0.93, 1.08) | 0.9916 | 1.14 (1.05, 1.24) | **0.0024** |
| D5 (14.81-15.02 g/dL) vs. D8 | 1,410 (8.5) | 1.04 (0.96, 1.12) | 0.3543 | 1.04 (0.96, 1.12) | 0.3296 | 1.14 (1.05, 1.25) | **0.0028** |
| D6 (15.03-15.29 g/dL) vs. D8 | 1,556 (8.3) | 1.01 (0.94, 1.09) | 0.8010 | 1.02 (0.94, 1.10) | 0.6908 | 1.09 (1.01, 1.19) | **0.0384** |
| D7 (15.30-15.51 g/dL) vs. D8 | 1,448 (8.1) | 0.99 (0.92, 1.07) | 0.7728 | 0.99 (0.91, 1.06) | 0.7045 | 1.04 (0.95, 1.13) | 0.4350 |
| D8 (15.52-15.81 g/dL) | 1,493 (8.2) | Reference | - | Reference | - | Reference | - |
| D9 (15.82-16.23 g/dL) vs. D8 | 1,533 (8.5) | 1.05 (0.97, 1.13) | 0.2128 | 1.04 (0.97, 1.13) | 0.2604 | 1.03 (0.94, 1.12) | 0.5500 |
| D10 (>16.23 g/dL) vs. D8 | 1,781 (9.7) | 1.20 (1.12, 1.29) | **<0.0001** | 1.17 (1.09, 1.26) | **<0.0001** | 1.07 (0.99, 1.17) | 0.1041 |
| **Women¶ (*n*=204,429)** | 10,570 (5.2) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D8 | 1,400 (6.9) | 1.70 (1.57, 1.85) | **<0.0001** | 1.59 (1.46, 1.74) | **<0.0001** | 1.81 (1.63, 2.01) | **<0.0001** |
| D2 (12.40-12.79 g/dL) vs. D8 | 913 (4.6) | 1.07 (0.97, 1.17) | 0.1823 | 1.06 (0.96, 1.16) | 0.2534 | 1.21 (1.08, 1.35) | **0.0009** |
| D3 (12.80-13.09 g/dL) vs. D8 | 961 (4.5) | 1.01 (0.93, 1.11) | 0.7694 | 1.02 (0.93, 1.11) | 0.7388 | 1.18 (1.06, 1.32) | **0.0033** |
| D4 (13.10-13.30 g/dL) vs. D8 | 909 (4.3) | 0.96 (0.88, 1.06) | 0.4333 | 0.97 (0.88, 1.06) | 0.4726 | 1.06 (0.95, 1.19) | 0.2913 |
| D5 (13.31-13.52 g/dL) vs. D8 | 871 (4.4) | 0.96 (0.88, 1.06) | 0.3992 | 0.97 (0.88, 1.06) | 0.4974 | 1.10 (0.99, 1.23) | 0.0851 |
| D6 (13.53-13.75 g/dL) vs. D8 | 898 (4.4) | 0.95 (0.87, 1.05) | 0.3181 | 0.97 (0.88, 1.06) | 0.4707 | 1.03 (0.92, 1.15) | 0.5818 |
| D7 (13.76-13.99 g/dL) vs. D8 | 905 (4.5) | 0.97 (0.88, 1.06) | 0.4959 | 0.97 (0.89, 1.07) | 0.5677 | 1.03 (0.92, 1.15) | 0.6152 |
| D8 (14.00-14.28 g/dL) | 1,004 (4.7) | Reference | - | Reference | - | Reference | - |
| D9 (14.29-14.67 g/dL) vs. D8 | 1,161 (5.7) | 1.19 (1.09, 1.30) | **<0.0001** | 1.19 (1.09, 1.29) | **0.0001** | 1.12 (1.01, 1.24) | **0.0371** |
| D10 (>14.67 g/dL) vs. D8 | 1,548 (7.6) | 1.58 (1.46, 1.72) | **<0.0001** | 1.53 (1.41, 1.66) | **<0.0001** | 1.39 (1.26, 1.54) | **<0.0001** |

†Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

Table S24.1: Odds ratios of hypertension†† across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Hypertension** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 7,076 (34.2) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D2 | 712 (35.7) | 1.10 (0.95, 1.26) | 0.1973 | 1.10 (0.96, 1.27) | 0.1865 | 1.07 (0.93, 1.24) | 0.3461 |
| D2 (13.6-14.1 g/dL) | 679 (32.2) | Reference | - | Reference | - | Reference | - |
| D3 (14.2-14.5 g/dL) vs. D2 | 711 (31.6) | 1.01 (0.88, 1.17) | 0.8479 | 1.02 (0.89, 1.17) | 0.7954 | 1.02 (0.89, 1.17) | 0.7993 |
| D4 (14.6-14.8 g/dL) vs. D2 | 658 (32.5) | 1.11 (0.96, 1.28) | 0.1655 | 1.11 (0.96, 1.28) | 0.1654 | 1.11 (0.96, 1.28) | 0.1601 |
| D5 (14.9-15.1 g/dL) vs. D2 | 744 (32.8) | 1.09 (0.95, 1.25) | 0.2397 | 1.09 (0.94, 1.25) | 0.2481 | 1.08 (0.94, 1.24) | 0.2728 |
| D6 (15.2-15.3 g/dL) vs. D2 | 497 (32.4) | 1.13 (0.97, 1.32) | 0.1279 | 1.12 (0.96, 1.31) | 0.1381 | 1.13 (0.97, 1.32) | 0.1210 |
| D7 (15.4-15.6 g/dL) vs. D2 | 733 (33.4) | 1.18 (1.03, 1.36) | **0.0193** | 1.18 (1.03, 1.36) | **0.0216** | 1.17 (1.01, 1.35) | **0.0317** |
| D8 (15.7-16.0 g/dL) vs. D2 | 844 (34.7) | 1.28 (1.11, 1.46) | **0.0005** | 1.28 (1.12, 1.47) | **0.0004** | 1.26 (1.10, 1.45) | **0.0010** |
| D9 (16.1-16.4 g/dL) vs. D2 | 609 (34.6) | 1.34 (1.15, 1.55) | **0.0001** | 1.33 (1.15, 1.55) | **0.0002** | 1.29 (1.12, 1.50) | **0.0007** |
| D10 (>16.4 g/dL) vs. D2 | 889 (42.4) | 1.76 (1.53, 2.03) | **<0.0001** | 1.76 (1.53, 2.02) | **<0.0001** | 1.67 (1.45, 1.92) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 9,002 (19.3) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) vs. D3 | 560 (11.7) | 1.10 (0.96, 1.25) | 0.1690 | 1.10 (0.96, 1.25) | 0.1731 | 1.08 (0.94, 1.23) | 0.2836 |
| D2 (11.6-12.1 g/dL) vs. D3 | 573 (14.2) | 1.07 (0.93, 1.22) | 0.3469 | 1.07 (0.93, 1.22) | 0.3449 | 1.07 (0.93, 1.22) | 0.3485 |
| D3 (12.2-12.5 g/dL) | 647 (14.5) | Reference | - | Reference | - | Reference | - |
| D4 (12.6-12.8 g/dL) vs. D3 | 756 (16.6) | 1.12 (0.99, 1.26) | 0.0819 | 1.12 (0.99, 1.26) | 0.0833 | 1.14 (1.003, 1.29) | **0.0447** |
| D5 (12.9-13.1 g/dL) vs. D3 | 901 (17.3) | 1.11 (0.99, 1.25) | 0.0885 | 1.11 (0.98, 1.25) | 0.0922 | 1.12 (1.00, 1.27) | 0.0613 |
| D6 (13.2-13.4 g/dL) vs. D3 | 1,076 (18.9) | 1.17 (1.04, 1.31) | **0.0078** | 1.17 (1.04, 1.31) | **0.0079** | 1.19 (1.06, 1.33) | **0.0043** |
| D7 (13.5-13.6 g/dL) vs. D3 | 695 (20.6) | 1.28 (1.13, 1.46) | **0.0001** | 1.28 (1.13, 1.46) | **0.0001** | 1.29 (1.13, 1.46) | **0.0001** |
| D8 (13.7-13.9 g/dL) vs. D3 | 1,066 (22.9) | 1.39 (1.24, 1.57) | **<0.0001** | 1.39 (1.24, 1.57) | **<0.0001** | 1.40 (1.24, 1.58) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D3 | 1,378 (24.9) | 1.48 (1.33, 1.66) | **<0.0001** | 1.48 (1.33, 1.66) | **<0.0001** | 1.47 (1.31, 1.65) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D3 | 1,350 (31.8) | 1.92 (1.71, 2.15) | **<0.0001** | 1.92 (1.71, 2.16) | **<0.0001** | 1.85 (1.65, 2.08) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Based on Taiwan Society of Cardiology and Taiwan Hypertension Society classification of hypertension.

Table S24.2: Odds ratios of hypertension†† across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Hypertension** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 116,701 (64.1) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) | 11,243 (64.1) | Reference | - | Reference | - | Reference | - |
| D2 (13.80-14.24 g/dL) vs. D1 | 11,461 (60.3) | 0.92 (0.88, 0.97) | **0.0007** | 0.93 (0.88, 0.97) | **0.0009** | 0.98 (0.93, 1.03) | 0.4767 |
| D3 (14.25-14.54 g/dL) vs. D1 | 10,882 (60.2) | 0.94 (0.90, 0.98) | **0.0072** | 0.94 (0.90, 0.99) | **0.0109** | 1.01 (0.96, 1.06) | 0.6941 |
| D4 (14.55-14.80 g/dL) vs. D1 | 12,026 (61.3) | 0.97 (0.93, 1.02) | 0.2251 | 0.98 (0.93, 1.02) | 0.3049 | 1.03 (0.98, 1.08) | 0.2393 |
| D5 (14.81-15.02 g/dL) vs. D1 | 10,249 (62.0) | 1.02 (0.97, 1.07) | 0.3793 | 1.03 (0.98, 1.08) | 0.2526 | 1.10 (1.04, 1.16) | **0.0004** |
| D6 (15.03-15.29 g/dL) vs. D1 | 11,898 (63.8) | 1.10 (1.05, 1.15) | **<0.0001** | 1.11 (1.06, 1.16) | **<0.0001** | 1.17 (1.11, 1.23) | **<0.0001** |
| D7 (15.30-15.51 g/dL) vs. D1 | 11,345 (63.2) | 1.08 (1.03, 1.13) | **0.0012** | 1.09 (1.04, 1.14) | **0.0006** | 1.15 (1.09, 1.21) | **<0.0001** |
| D8 (15.52-15.81 g/dL) vs. D1 | 11,977 (65.4) | 1.17 (1.12, 1.23) | **<0.0001** | 1.18 (1.13, 1.24) | **<0.0001** | 1.25 (1.19, 1.32) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D1 | 12,287 (68.2) | 1.33 (1.27, 1.40) | **<0.0001** | 1.34 (1.28, 1.41) | **<0.0001** | 1.42 (1.34, 1.49) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D1 | 13,333 (72.9) | 1.61 (1.53, 1.69) | **<0.0001** | 1.62 (1.54, 1.70) | **<0.0001** | 1.71 (1.62, 1.80) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 102,058 (49.9) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D2 | 8,365 (41.3) | 1.07 (1.02, 1.12) | **0.0028** | 1.06 (1.02, 1.11) | **0.0053** | 1.04 (0.99, 1.09) | 0.1518 |
| D2 (12.40-12.79 g/dL) | 8,228 (41.7) | Reference | - | Reference | - | Reference | - |
| D3 (12.80-13.09 g/dL) vs. D2 | 9,245 (43.4) | 1.02 (0.98, 1.07) | 0.2871 | 1.02 (0.98, 1.07) | 0.2737 | 1.02 (0.97, 1.07) | 0.5629 |
| D4 (13.10-13.30 g/dL) vs. D2 | 9,570 (45.6) | 1.09 (1.04, 1.14) | **<0.0001** | 1.09 (1.05, 1.14) | **<0.0001** | 1.09 (1.04, 1.15) | **0.0003** |
| D5 (13.31-13.52 g/dL) vs. D2 | 9,406 (47.6) | 1.13 (1.09, 1.18) | **<0.0001** | 1.14 (1.09, 1.19) | **<0.0001** | 1.15 (1.09, 1.20) | **<0.0001** |
| D6 (13.53-13.75 g/dL) vs. D2 | 10,002 (49.0) | 1.18 (1.13, 1.23) | **<0.0001** | 1.19 (1.14, 1.24) | **<0.0001** | 1.19 (1.13, 1.25) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D2 | 10,264 (51.4) | 1.25 (1.19, 1.30) | **<0.0001** | 1.25 (1.20, 1.31) | **<0.0001** | 1.26 (1.20, 1.32) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D2 | 11,573 (54.4) | 1.37 (1.32, 1.43) | **<0.0001** | 1.38 (1.33, 1.44) | **<0.0001** | 1.38 (1.32, 1.45) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D2 | 12,018 (58.9) | 1.57 (1.50, 1.64) | **<0.0001** | 1.58 (1.52, 1.65) | **<0.0001** | 1.56 (1.48, 1.64) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D2 | 13,387 (65.9) | 2.00 (1.92, 2.09) | **<0.0001** | 2.03 (1.94, 2.12) | **<0.0001** | 1.99 (1.89, 2.10) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Based on European Society of Cardiology/National Institute for Health and Care Excellence classification of hypertension.

Table S24.3: Odds ratios of dyslipidemia†† across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Dyslipidemia** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 9,066 (43.9) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D2 | 796 (39.9) | 1.22 (1.07, 1.39) | **0.0024** | 1.21 (1.07, 1.38) | **0.0037** | 1.18 (1.03, 1.34) | **0.0162** |
| D2 (13.6-14.1 g/dL) | 750 (35.6) | Reference | - | Reference | - | Reference | - |
| D3 (14.2-14.5 g/dL) vs. D2 | 860 (38.2) | 1.11 (0.97, 1.26) | 0.1190 | 1.09 (0.96, 1.24) | 0.1695 | 1.10 (0.97, 1.25) | 0.1532 |
| D4 (14.6-14.8 g/dL) vs. D2 | 798 (39.4) | 1.15 (1.01, 1.31) | **0.0321** | 1.14 (1.00, 1.30) | 0.0503 | 1.14 (1.003, 1.31) | **0.0454** |
| D5 (14.9-15.1 g/dL) vs. D2 | 966 (42.6) | 1.28 (1.13, 1.45) | **0.0001** | 1.27 (1.12, 1.44) | **0.0003** | 1.27 (1.12, 1.45) | **0.0002** |
| D6 (15.2-15.3 g/dL) vs. D2 | 659 (42.9) | 1.28 (1.11, 1.47) | **0.0006** | 1.26 (1.09, 1.45) | **0.0013** | 1.27 (1.11, 1.47) | **0.0008** |
| D7 (15.4-15.6 g/dL) vs. D2 | 994 (45.4) | 1.39 (1.22, 1.58) | **<0.0001** | 1.37 (1.21, 1.56) | **<0.0001** | 1.37 (1.20, 1.56) | **<0.0001** |
| D8 (15.7-16.0 g/dL) vs. D2 | 1,128 (46.4) | 1.44 (1.27, 1.63) | **<0.0001** | 1.41 (1.25, 1.60) | **<0.0001** | 1.40 (1.23, 1.59) | **<0.0001** |
| D9 (16.1-16.4 g/dL) vs. D2 | 894 (50.8) | 1.71 (1.49, 1.95) | **<0.0001** | 1.65 (1.44, 1.89) | **<0.0001** | 1.63 (1.43, 1.87) | **<0.0001** |
| D10 (>16.4 g/dL) vs. D2 | 1,221 (58.2) | 2.14 (1.88, 2.43) | **<0.0001** | 2.01 (1.76, 2.29) | **<0.0001** | 1.91 (1.68, 2.18) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 19,868 (42.7) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) vs. D2 | 1,796 (37.4) | 1.14 (1.04, 1.25) | **0.0046** | 1.14 (1.04, 1.25) | **0.0047** | 1.13 (1.03, 1.24) | **0.0080** |
| D2 (11.6-12.1 g/dL) | 1,459 (36.1) | Reference | - | Reference | - | Reference | - |
| D3 (12.2-12.5 g/dL) vs. D2 | 1,620 (36.3) | 0.97 (0.88, 1.06) | 0.4954 | 0.97 (0.88, 1.06) | 0.5000 | 0.97 (0.89, 1.07) | 0.5628 |
| D4 (12.6-12.8 g/dL) vs. D2 | 1,753 (38.5) | 1.03 (0.94, 1.13) | 0.5028 | 1.03 (0.94, 1.13) | 0.5099 | 1.04 (0.94, 1.14) | 0.4646 |
| D5 (12.9-13.1 g/dL) vs. D2 | 2,091 (40.1) | 1.08 (0.99, 1.18) | 0.0879 | 1.08 (0.99, 1.18) | 0.0859 | 1.09 (0.998, 1.19) | 0.0549 |
| D6 (13.2-13.4 g/dL) vs. D2 | 2,421 (42.5) | 1.13 (1.04, 1.24) | **0.0049** | 1.13 (1.04, 1.23) | **0.0055** | 1.14 (1.04, 1.24) | **0.0038** |
| D7 (13.5-13.6 g/dL) vs. D2 | 1,483 (44.0) | 1.18 (1.07, 1.30) | **0.0010** | 1.18 (1.07, 1.30) | **0.0012** | 1.17 (1.06, 1.29) | **0.0019** |
| D8 (13.7-13.9 g/dL) vs. D2 | 2,132 (45.9) | 1.24 (1.14, 1.36) | **<0.0001** | 1.24 (1.13, 1.36) | **<0.0001** | 1.24 (1.13, 1.35) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D2 | 2,749 (49.7) | 1.38 (1.26, 1.50) | **<0.0001** | 1.37 (1.26, 1.50) | **<0.0001** | 1.35 (1.24, 1.48) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D2 | 2,364 (55.8) | 1.61 (1.47, 1.77) | **<0.0001** | 1.59 (1.45, 1.75) | **<0.0001** | 1.51 (1.37, 1.66) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Described as either hypertriglyceridemia, low levels of HLD-C, or a combination of the two.

Table S24.4: Odds ratios of dyslipidemia†† across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Dyslipidemia** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 128,064 (70.4) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) | 11,993 (68.4) | Reference | - | Reference | - | Reference | - |
| D2 (13.80-14.24 g/dL) vs. D1 | 12,662 (66.7) | 0.95 (0.91, 0.99) | **0.0260** | 0.96 (0.92, 1.01) | 0.0774 | 1.03 (0.98, 1.08) | 0.3136 |
| D3 (14.25-14.54 g/dL) vs. D1 | 12,228 (67.7) | 0.99 (0.94, 1.04) | 0.6074 | 1.00 (0.96, 1.05) | 0.9019 | 1.08 (1.02, 1.13) | **0.0054** |
| D4 (14.55-14.80 g/dL) vs. D1 | 13,484 (68.7) | 1.02 (0.97, 1.06) | 0.4676 | 1.03 (0.99, 1.08) | 0.1893 | 1.11 (1.06, 1.17) | **<0.0001** |
| D5 (14.81-15.02 g/dL) vs. D1 | 11,486 (69.5) | 1.05 (1.001, 1.10) | **0.0433** | 1.07 (1.02, 1.12) | **0.0086** | 1.14 (1.08, 1.20) | **<0.0001** |
| D6 (15.03-15.29 g/dL) vs. D1 | 13,137 (70.4) | 1.09 (1.04, 1.14) | **0.0002** | 1.11 (1.06, 1.16) | **<0.0001** | 1.17 (1.11, 1.23) | **<0.0001** |
| D7 (15.30-15.51 g/dL) vs. D1 | 12,764 (71.1) | 1.12 (1.07, 1.18) | **<0.0001** | 1.13 (1.08, 1.19) | **<0.0001** | 1.21 (1.15, 1.28) | **<0.0001** |
| D8 (15.52-15.81 g/dL) vs. D1 | 13,302 (72.6) | 1.18 (1.13, 1.24) | **<0.0001** | 1.20 (1.14, 1.25) | **<0.0001** | 1.27 (1.21, 1.34) | **<0.0001** |
| D9 (15.82-16.23 g/dL) vs. D1 | 13,159 (73.0) | 1.19 (1.14, 1.25) | **<0.0001** | 1.20 (1.14, 1.26) | **<0.0001** | 1.25 (1.18, 1.31) | **<0.0001** |
| D10 (>16.23 g/dL) vs. D1 | 13,849 (75.7) | 1.30 (1.24, 1.37) | **<0.0001** | 1.29 (1.23, 1.36) | **<0.0001** | 1.32 (1.25, 1.40) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 138,861 (67.9) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) | 12,085 (59.6) | Reference | - | Reference | - | Reference | - |
| D2 (12.40-12.79 g/dL) vs. D1 | 12,025 (61.0) | 0.98 (0.94, 1.02) | 0.2764 | 0.99 (0.95, 1.03) | 0.6292 | 1.00 (0.95, 1.05) | 0.9456 |
| D3 (12.80-13.09 g/dL) vs. D1 | 13,473 (63.2) | 1.04 (0.995, 1.08) | 0.0848 | 1.05 (1.01, 1.10) | **0.0180** | 1.08 (1.03, 1.13) | **0.0024** |
| D4 (13.10-13.30 g/dL) vs. D1 | 13,713 (65.3) | 1.11 (1.06, 1.16) | **<0.0001** | 1.12 (1.08, 1.17) | **<0.0001** | 1.17 (1.11, 1.22) | **<0.0001** |
| D5 (13.31-13.52 g/dL) vs. D1 | 13,086 (66.3) | 1.11 (1.06, 1.16) | **<0.0001** | 1.13 (1.08, 1.18) | **<0.0001** | 1.14 (1.08, 1.20) | **<0.0001** |
| D6 (13.53-13.75 g/dL) vs. D1 | 13,933 (68.3) | 1.20 (1.15, 1.25) | **<0.0001** | 1.22 (1.17, 1.27) | **<0.0001** | 1.22 (1.16, 1.28) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D1 | 14,010 (70.2) | 1.26 (1.21, 1.32) | **<0.0001** | 1.27 (1.22, 1.33) | **<0.0001** | 1.29 (1.22, 1.35) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D1 | 15,329 (72.0) | 1.35 (1.29, 1.41) | **<0.0001** | 1.35 (1.30, 1.42) | **<0.0001** | 1.38 (1.31, 1.45) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D1 | 15,184 (74.3) | 1.44 (1.37, 1.50) | **<0.0001** | 1.43 (1.37, 1.49) | **<0.0001** | 1.42 (1.35, 1.50) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D1 | 16,023 (78.9) | 1.74 (1.66, 1.82) | **<0.0001** | 1.69 (1.61, 1.77) | **<0.0001** | 1.64 (1.56, 1.73) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate. ††Described as either hypertriglyceridemia, low levels of HLD-C, or a combination of the two.

Table S24.5: Odds ratios of gout across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Gout** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 6,876 (33.3) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D3 | 646 (32.3) | 1.24 (1.09, 1.42) | **0.0016** | 1.24 (1.09, 1.42) | **0.0015** | 1.24 (1.08, 1.42) | **0.0020** |
| D2 (13.6-14.1 g/dL) vs. D3 | 619 (29.3) | 1.05 (0.92, 1.20) | 0.4556 | 1.05 (0.92, 1.20) | 0.4786 | 1.06 (0.93, 1.22) | 0.3847 |
| D3 (14.2-14.5 g/dL) | 655 (29.1) | Reference | - | Reference | - | Reference | - |
| D4 (14.6-14.8 g/dL) vs. D3 | 599 (29.6) | 1.01 (0.88, 1.16) | 0.8779 | 1.01 (0.88, 1.16) | 0.8929 | 1.00 (0.87, 1.15) | 0.9890 |
| D5 (14.9-15.1 g/dL) vs. D3 | 754 (33.2) | 1.15 (1.01, 1.31) | **0.0356** | 1.15 (1.01, 1.31) | **0.0400** | 1.13 (0.99, 1.29) | 0.0717 |
| D6 (15.2-15.3 g/dL) vs. D3 | 504 (32.8) | 1.11 (0.96, 1.28) | 0.1727 | 1.10 (0.95, 1.27) | 0.1920 | 1.08 (0.93, 1.25) | 0.3109 |
| D7 (15.4-15.6 g/dL) vs. D3 | 760 (34.7) | 1.17 (1.02, 1.33) | **0.0205** | 1.16 (1.02, 1.32) | **0.0260** | 1.13 (0.99, 1.29) | 0.0770 |
| D8 (15.7-16.0 g/dL) vs. D3 | 854 (35.1) | 1.18 (1.04, 1.34) | **0.0117** | 1.18 (1.04, 1.34) | **0.0123** | 1.13 (1.00, 1.29) | 0.0592 |
| D9 (16.1-16.4 g/dL) vs. D3 | 645 (36.6) | 1.22 (1.07, 1.40) | **0.0041** | 1.21 (1.06, 1.39) | **0.0064** | 1.14 (0.99, 1.31) | 0.0664 |
| D10 (>16.4 g/dL) vs. D3 | 841 (40.1) | 1.32 (1.16, 1.51) | **<0.0001** | 1.31 (1.15, 1.49) | **<0.0001** | 1.20 (1.05, 1.37) | **0.0083** |
| **Women¶ (*n*=46,567)** | 6,704 (14.4) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) | 396 (8.3) | Reference | - | Reference | - | Reference | - |
| D2 (11.6-12.1 g/dL) vs. D1 | 428 (10.6) | 1.20 (1.04, 1.39) | **0.0159** | 1.21 (1.04, 1.40) | **0.0141** | 1.23 (1.05, 1.42) | **0.0083** |
| D3 (12.2-12.5 g/dL) vs. D1 | 483 (10.8) | 1.18 (1.02, 1.37) | **0.0236** | 1.18 (1.02, 1.37) | **0.0235** | 1.22 (1.05, 1.41) | **0.0087** |
| D4 (12.6-12.8 g/dL) vs. D1 | 503 (11.0) | 1.15 (0.99, 1.32) | 0.0638 | 1.14 (0.99, 1.32) | 0.0746 | 1.17 (1.01, 1.36) | **0.0321** |
| D5 (12.9-13.1 g/dL) vs. D1 | 658 (12.6) | 1.31 (1.14, 1.50) | **0.0001** | 1.30 (1.13, 1.49) | **0.0002** | 1.33 (1.15, 1.52) | **<0.0001** |
| D6 (13.2-13.4 g/dL) vs. D1 | 808 (14.2) | 1.39 (1.22, 1.59) | **<0.0001** | 1.39 (1.22, 1.59) | **<0.0001** | 1.41 (1.23, 1.61) | **<0.0001** |
| D7 (13.5-13.6 g/dL) vs. D1 | 554 (16.5) | 1.63 (1.41, 1.88) | **<0.0001** | 1.63 (1.41, 1.88) | **<0.0001** | 1.64 (1.41, 1.89) | **<0.0001** |
| D8 (13.7-13.9 g/dL) vs. D1 | 773 (16.6) | 1.59 (1.39, 1.82) | **<0.0001** | 1.58 (1.38, 1.81) | **<0.0001** | 1.57 (1.37, 1.79) | **<0.0001** |
| D9 (14.0-14.4 g/dL) vs. D1 | 1,029 (18.6) | 1.69 (1.49, 1.93) | **<0.0001** | 1.69 (1.48, 1.92) | **<0.0001** | 1.64 (1.44, 1.87) | **<0.0001** |
| D10 (>14.4 g/dL) vs. D1 | 1,072 (25.3) | 2.28 (2.00, 2.60) | **<0.0001** | 2.27 (1.99, 2.59) | **<0.0001** | 2.13 (1.87, 2.43) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

Table S24.6: Odds ratios of gout across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Gout** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 36,401 (20.0) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) vs. D3 | 3,549 (20.2) | 1.17 (1.11, 1.24) | **<0.0001** | 1.19 (1.13, 1.26) | **<0.0001** | 1.18 (1.11, 1.25) | **<0.0001** |
| D2 (13.80-14.24 g/dL) vs. D3 | 3,474 (18.3) | 1.04 (0.98, 1.10) | 0.2015 | 1.03 (0.98, 1.09) | 0.2357 | 1.03 (0.97, 1.10) | 0.2890 |
| D3 (14.25-14.54 g/dL) | 3,261 (18.0) | Reference | - | Reference | - | Reference | - |
| D4 (14.55-14.80 g/dL) vs. D3 | 3,693 (18.8) | 1.02 (0.97, 1.08) | 0.3807 | 1.02 (0.97, 1.08) | 0.4018 | 1.01 (0.95, 1.07) | 0.8702 |
| D5 (14.81-15.02 g/dL) vs. D3 | 3,193 (19.3) | 1.04 (0.99, 1.10) | 0.1381 | 1.05 (0.99, 1.11) | 0.0864 | 1.05 (0.98, 1.11) | 0.1591 |
| D6 (15.03-15.29 g/dL) vs. D3 | 3,615 (20.1) | 1.07 (1.02, 1.13) | **0.0121** | 1.08 (1.02, 1.14) | **0.0062** | 1.05 (0.99, 1.12) | 0.0927 |
| D7 (15.30-15.51 g/dL) vs. D3 | 3,843 (21.0) | 1.07 (1.02, 1.13) | **0.0120** | 1.08 (1.03, 1.14) | **0.0040** | 1.06 (1.001, 1.13) | **0.0449** |
| D8 (15.52-15.81 g/dL) vs. D3 | 3,843 (21.0) | 1.10 (1.04, 1.16) | **0.0005** | 1.12 (1.06, 1.18) | **<0.0001** | 1.08 (1.02, 1.15) | **0.0101** |
| D9 (15.82-16.23 g/dL) vs. D3 | 3,789 (21.0) | 1.08 (1.02, 1.14) | **0.0050** | 1.10 (1.05, 1.17) | **0.0003** | 1.07 (1.01, 1.14) | **0.0239** |
| D10 (>16.24 g/dL) vs. D3 | 4,280 (23.4) | 1.18 (1.12, 1.24) | **<0.0001** | 1.22 (1.16, 1.29) | **<0.0001** | 1.16 (1.09, 1.23) | **<0.0001** |
| **Women¶ (*n*=204,429)** | 19,305 (9.4) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D3 | 1,567 (7.7) | 1.24 (1.15, 1.34) | **<0.0001** | 1.25 (1.15, 1.35) | **<0.0001** | 1.17 (1.07, 1.28) | **0.0009** |
| D2 (12.40-12.79 g/dL) vs. D3 | 1,330 (6.7) | 1.02 (0.94, 1.11) | 0.5981 | 1.02 (0.94, 1.11) | 0.5978 | 1.03 (0.94, 1.13) | 0.5686 |
| D3 (12.80-13.09 g/dL) vs. D3 | 1,471 (6.9) | Reference | - | Reference | - | Reference | - |
| D4 (13.10-13.30 g/dL) vs. D3 | 1,664 (7.9) | 1.12 (1.04, 1.21) | **0.0039** | 1.12 (1.04, 1.21) | **0.0043** | 1.14 (1.05, 1.25) | **0.0032** |
| D5 (13.31-13.52 g/dL) vs. D3 | 1,642 (8.3) | 1.13 (1.04, 1.22) | **0.0024** | 1.13 (1.04, 1.22) | **0.0024** | 1.13 (1.03, 1.23) | **0.0095** |
| D6 (13.53-13.75 g/dL) vs. D3 | 1,823 (8.9) | 1.20 (1.11, 1.29) | **<0.0001** | 1.20 (1.11, 1.29) | **<0.0001** | 1.19 (1.09, 1.30) | **<0.0001** |
| D7 (13.76-13.99 g/dL) vs. D3 | 1,933 (9.7) | 1.22 (1.15, 1.33) | **<0.0001** | 1.23 (1.15, 1.33) | **<0.0001** | 1.21 (1.11, 1.32) | **<0.0001** |
| D8 (14.00-14.28 g/dL) vs. D3 | 2,271 (10.7) | 1.33 (1.24, 1.43) | **<0.0001** | 1.33 (1.24, 1.43) | **<0.0001** | 1.29 (1.18, 1.40) | **<0.0001** |
| D9 (14.29-14.67 g/dL) vs. D3 | 2,490 (12.2) | 1.45 (1.35, 1.55) | **<0.0001** | 1.45 (1.35, 1.55) | **<0.0001** | 1.37 (1.26, 1.49) | **<0.0001** |
| D10 (>14.67 g/dL) vs. D3 | 3,114 (15.3) | 1.71 (1.60, 1.83) | **<0.0001** | 1.72 (1.61, 1.84) | **<0.0001** | 1.60 (1.47, 1.73) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

Table S24.7: Odds ratios of diabetes across increasing deciles of hemoglobin levels among Taiwanese Han Chinese

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Diabetes** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=20,670)** | 2,812 (13.6) |  |  |  |  |  |  |
| D1 (<13.6 g/dL) vs. D6 | 388 (19.2) | 1.80 (1.46, 2.21) | **<0.0001** | 1.79 (1.46, 2.21) | **<0.0001** | 1.83 (1.49, 2.26) | **<0.0001** |
| D2 (13.6-14.1 g/dL) vs. D6 | 307 (14.6) | 1.33 (1.07, 1.64) | **0.0088** | 1.34 (1.08, 1.66) | **0.0068** | 1.42 (1.14, 1.76) | **0.0015** |
| D3 (14.2-14.5 g/dL) vs. D6 | 295 (13.1) | 1.22 (0.99, 1.51) | 0.0605 | 1.23 (0.99, 1.52) | 0.0565 | 1.27 (1.03, 1.58) | **0.0277** |
| D4 (14.6-14.8 g/dL) vs. D6 | 239 (11.8) | 1.11 (0.89, 1.38) | 0.3614 | 1.10 (0.89, 1.37) | 0.3839 | 1.12 (0.90, 1.40) | 0.3125 |
| D5 (14.9-15.1 g/dL) vs. D6 | 277 (12.2) | 1.12 (0.91, 1.39) | 0.2814 | 1.13 (0.91, 1.40) | 0.2629 | 1.14 (0.92, 1.42) | 0.2310 |
| D6 (15.2-15.3 g/dL) | 163 (10.6) | Reference | - | Reference | - | Reference | - |
| D7 (15.4-15.6 g/dL) vs. D6 | 259 (11.8) | 1.13 (0.91, 1.40) | 0.2859 | 1.13 (0.91, 1.40) | 0.2879 | 1.11 (0.89, 1.38) | 0.3484 |
| D8 (15.7-16.0 g/dL) vs. D6 | 298 (12.3) | 1.19 (0.97, 1.47) | 0.1015 | 1.19 (0.96, 1.47) | 0.1126 | 1.16 (0.94, 1.44) | 0.1702 |
| D9 (16.1-16.4 g/dL) vs. D6 | 224 (12.7) | 1.32 (1.05, 1.65) | **0.0164** | 1.30 (1.04, 1.62) | **0.0238** | 1.25 (1.00, 1.57) | 0.0544 |
| D10 (>16.4 g/dL) vs. D6 | 362 (17.3) | 1.78 (1.44, 2.18) | **<0.0001** | 1.72 (1.40, 2.12) | **<0.0001** | 1.57 (1.27, 1.94) | **<0.0001** |
| **Women¶ (*n*=46,567)** | 4,065 (8.7) |  |  |  |  |  |  |
| D1 (<11.6 g/dL) vs. D5 | 301 (6.3) | 1.38 (1.17, 1.63) | **0.0001** | 1.38 (1.17, 1.63) | **0.0001** | 1.36 (1.15, 1.61) | **0.0004** |
| D2 (11.6-12.1 g/dL) vs. D5 | 287 (7.1) | 1.24 (1.05, 1.46) | **0.0130** | 1.23 (1.04, 1.46) | **0.0144** | 1.24 (1.05, 1.47) | **0.0135** |
| D3 (12.2-12.5 g/dL) vs. D5 | 319 (7.2) | 1.15 (0.98, 1.35) | 0.0920 | 1.15 (0.98, 1.35) | 0.0908 | 1.18 (0.999, 1.39) | 0.0517 |
| D4 (12.6-12.8 g/dL) vs. D5 | 328 (7.2) | 1.08 (0.92, 1.27) | 0.3547 | 1.08 (0.92, 1.27) | 0.3494 | 1.10 (0.93, 1.29) | 0.2596 |
| D5 (12.9-13.1 g/dL) | 368 (7.1) | Reference | - | Reference | - | Reference | - |
| D6 (13.2-13.4 g/dL) vs. D5 | 452 (7.9) | 1.07 (0.92, 1.24) | 0.4089 | 1.06 (0.92, 1.24) | 0.4101 | 1.07 (0.92, 1.24) | 0.3976 |
| D7 (13.5-13.6 g/dL) vs. D5 | 312 (9.3) | 1.23 (1.05, 1.45) | **0.0120** | 1.23 (1.05, 1.45) | **0.0128** | 1.22 (1.03, 1.44) | **0.0194** |
| D8 (13.7-13.9 g/dL) vs. D5 | 422 (9.1) | 1.13 (0.97, 1.31) | 0.1248 | 1.12 (0.97, 1.31) | 0.1326 | 1.08 (0.93, 1.26) | 0.3231 |
| D9 (14.0-14.4 g/dL) vs. D5 | 605 (10.9) | 1.32 (1.14, 1.51) | **0.0001** | 1.32 (1.14, 1.52) | **0.0001** | 1.25 (1.08, 1.44) | **0.0027** |
| D10 (>14.4 g/dL) vs. D5 | 671 (15.8) | 1.82 (1.58, 2.10) | **<0.0001** | 1.81 (1.58, 2.09) | **<0.0001** | 1.64 (1.42, 1.89) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.

Table S24.8: Odds ratios of diabetes across increasing deciles of hemoglobin levels among European Whites

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Diabetes** | **Cases (%)** | **Model 1**† | ***P*-value** | **Model 2**‡ | ***P*-value** | **Model 3**§ | ***P*-value** |
| **Men (*n*=182,048)** | 17,180 (9.4) |  |  |  |  |  |  |
| D1 (<13.80 g/dL) vs. D8 | 2,854 (16.3) | 2.33 (2.17, 2.50) | **<0.0001** | 2.25 (2.10, 2.41) | **<0.0001** | 2.33 (2.15, 2.53) | **<0.0001** |
| D2 (13.80-14.24 g/dL) vs. D8 | 1,888 (9.9) | 1.35 (1.25, 1.45) | **<0.0001** | 1.34 (1.24, 1.44) | **<0.0001** | 1.42 (1.30, 1.54) | **<0.0001** |
| D3 (14.25-14.54 g/dL) vs. D8 | 1,570 (8.7) | 1.17 (1.08, 1.26) | **<0.0001** | 1.17 (1.09, 1.27) | **<0.0001** | 1.25 (1.15, 1.37) | **<0.0001** |
| D4 (14.55-14.80 g/dL) vs. D8 | 1,647 (8.4) | 1.10 (1.02, 1.18) | **0.0184** | 1.10 (1.02, 1.19) | **0.0123** | 1.19 (1.10, 1.30) | **<0.0001** |
| D5 (14.81-15.02 g/dL) vs. D8 | 1,410 (8.5) | 1.11 (1.02, 1.20) | **0.0132** | 1.11 (1.03, 1.20) | **0.0090** | 1.18 (1.08, 1.29) | **0.0003** |
| D6 (15.03-15.29 g/dL) vs. D8 | 1,556 (8.3) | 1.07 (0.99, 1.15) | 0.0930 | 1.08 (1.00, 1.17) | 0.0547 | 1.13 (1.03, 1.23) | **0.0066** |
| D7 (15.30-15.51 g/dL) vs. D8 | 1,448 (8.1) | 1.01 (0.94, 1.09) | 0.7674 | 1.01 (0.93, 1.09) | 0.8121 | 1.05 (0.96, 1.14) | 0.3348 |
| D8 (15.52-15.81 g/dL) | 1,493 (8.2) | Reference | - | Reference | - | Reference | - |
| D9 (15.82-16.23 g/dL) vs. D8 | 1,533 (8.5) | 1.02 (0.95, 1.10) | 0.5966 | 1.02 (0.94, 1.10) | 0.6471 | 1.02 (0.93, 1.11) | 0.7164 |
| D10 (>16.23 g/dL) vs. D8 | 1,781 (9.7) | 1.11 (1.03, 1.20) | **0.0063** | 1.08 (1.00, 1.17) | **0.0412** | 1.03 (0.95, 1.13) | 0.4407 |
| **Women¶ (*n*=204,429)** | 10,570 (5.2) |  |  |  |  |  |  |
| D1 (<12.40 g/dL) vs. D8 | 1,400 (6.9) | 1.98 (1.82, 2.16) | **<0.0001** | 1.87 (1.71, 2.04) | **<0.0001** | 1.98 (1.78, 2.20) | **<0.0001** |
| D2 (12.40-12.79 g/dL) vs. D8 | 913 (4.6) | 1.25 (1.13, 1.37) | **<0.0001** | 1.23 (1.12, 1.36) | **<0.0001** | 1.31 (1.17, 1.47) | **<0.0001** |
| D3 (12.80-13.09 g/dL) vs. D8 | 961 (4.5) | 1.16 (1.06, 1.27) | **0.0017** | 1.16 (1.06, 1.27) | **0.0019** | 1.26 (1.13, 1.41) | **<0.0001** |
| D4 (13.10-13.30 g/dL) vs. D8 | 909 (4.3) | 1.08 (0.98, 1.18) | 0.1268 | 1.07 (0.98, 1.18) | 0.1476 | 1.12 (1.001, 1.25) | **0.0482** |
| D5 (13.31-13.52 g/dL) vs. D8 | 871 (4.4) | 1.05 (0.95, 1.15) | 0.3339 | 1.05 (0.95, 1.15) | 0.3394 | 1.16 (1.03, 1.29) | **0.0124** |
| D6 (13.53-13.75 g/dL) vs. D8 | 898 (4.4) | 1.03 (0.93, 1.13) | 0.5988 | 1.03 (0.94, 1.13) | 0.5278 | 1.07 (0.95, 1.20) | 0.2597 |
| D7 (13.76-13.99 g/dL) vs. D8 | 905 (4.5) | 0.99 (0.90, 1.09) | 0.8956 | 0.99 (0.90, 1.09) | 0.8412 | 1.04 (0.93, 1.16) | 0.5234 |
| D8 (14.00-14.28 g/dL) | 1,004 (4.7) | Reference | - | Reference | - | Reference | - |
| D9 (14.29-14.67 g/dL) vs. D8 | 1,161 (5.7) | 1.14 (1.04, 1.24) | **0.0046** | 1.13 (1.03, 1.23) | **0.0092** | 1.09 (0.98, 1.21) | 0.1224 |
| D10 (>14.67 g/dL) vs. D8 | 1,548 (7.6) | 1.42 (1.30, 1.54) | **<0.0001** | 1.36 (1.25, 1.48) | **<0.0001** | 1.32 (1.19, 1.46) | **<0.0001** |

\*With BMI as additional covariate in all models. †Model 1 adjusted for age and age-squared. ‡Model 2 additionally adjusted for smoking and alcohol consumption. §Model 3 additionally adjusted for physical activity, highest educational attainment, and comorbidities. ¶In women, menopausal status was included as covariate.