**Preconception Paternal/Maternal Body Mass Index and Risk of Small/Large for Gestational Age Infant in over 4·7 Million Chinese Women Aged 20-49 Years: A Population-based Cohort Study in China**

**Supplemental Materials:**

Supplemental Table 2 Demographic Characteristics by Maternal preconception Body Mass Index. (n=4 719 813)

|  |  |  |
| --- | --- | --- |
|  |  | Maternal preconception BMI (mIU/L) levels |
|  |  | Underweight (<18·5) |  | Normal weight (18·5-) |  | Overweight (24·0-) |  | Obese (28·0-) |  |  |
| Maternal characteristics |  | n |  | % |  | n |  | % |  | n |  | % |  |  |  | % |  | P Value |
| n |  | 638 567 |  | 3 380 542 |  | 570 480 |  | 130 224 |  |  |
| Age at LMP (years) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20-24·9 |  | 324 660 |  | 50·84 |  | 1 444 353 |  | 42·73 |  | 185 664 |  | 32·54 |  | 39 516 |  | 30·34 |  | <0·001\* |
| 25-29·9 |  | 261 651 |  | 40·97 |  | 1 398 623 |  | 41·37 |  | 235 443 |  | 41·27 |  | 55 422 |  | 42·56 |  |
| 30-34·9 |  | 43 378 |  | 6·79 |  | 400 681 |  | 11·85 |  | 102 090 |  | 17·90 |  | 24 446 |  | 18·77 |  |
| 35-39·9 |  | 7927 |  | 1·24 |  | 117 496 |  | 3·47 |  | 39 423 |  | 6·91 |  | 9096 |  | 6·98 |  |
| ≥40 |  | 917 |  | 0·14 |  | 19 260 |  | 0·57 |  | 7847 |  | 1·38 |  | 1738 |  | 1·33 |  |
| Height (cm) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  ≤154·9 |  | 108 726 |  | 17·03 |  | 588 702 |  | 17·41 |  | 110 360 |  | 19·35 |  | 28 302 |  | 21·73 |  | <0·001\* |
|  155-164·9 |  | 450 148 |  | 70·49 |  | 2 432 961 |  | 71·97 |  | 390 429 |  | 68·44 |  | 86 301 |  | 66·27 |  |
|  165-174·9 |  | 667 12 |  | 10·45 |  | 318 821 |  | 9·43 |  | 64 492 |  | 11·30 |  | 14 547 |  | 14·09 |  |
|  ≥175 |  | 1138 |  | 0·18 |  | 4290 |  | 0·13 |  | 1085 |  | 0·19 |  | 277 |  | 0·21 |  |
| NA |  | 11 843 |  | 1·85 |  | 35 768 |  | 1·06 |  | 4114 |  | 0·72 |  | 797 |  | 0·61 |  |
| Parity |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  0 |  | 474 832 |  | 74·36 |  | 2 110 426 |  | 61·43 |  | 254 375 |  | 44·59 |  | 51 742 |  | 39·73 |  | <0·001\* |
|  1+ |  | 161 295 |  | 25·26 |  | 1 259 951 |  | 37·27 |  | 314 683 |  | 55·16 |  | 78 182 |  | 60·04 |  |
|  NA |  | 2440 |  | 0·38 |  | 10 165 |  | 0·30 |  | 1422 |  | 0·25 |  | 300 |  | 0·23 |  |
| Education |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  High school or above |  | 152 478 |  | 23·88 |  | 589 971 |  | 17·45 |  | 71 850 |  | 12·59 |  | 12 316 |  | 9·46 |  | <0·001\* |
|  Primary school or below |  | 464 298 |  | 72·71 |  | 2 695 824 |  | 79·75 |  | 484 686 |  | 84·96 |  | 115 045 |  | 88·34 |  |
|  NA |  | 21 791 |  | 3·41 |  | 94 747 |  | 2·80 |  | 13 944 |  | 2·44 |  | 2863 |  | 2·20 |  |
| Ethnic (Han) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Han |  | 587 230 |  | 91·96 |  | 3 109 079 |  | 91·97 |  | 526 739 |  | 92·33 |  | 121 390 |  | 93·22 |  | <0·001\* |
|  Missing data |  | 7427 |  | 1·16 |  | 32 659 |  | 0·97 |  | 4759 |  | 0·83 |  | 933 |  | 0·72 |  |
| Residence |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Rural |  | 573 400 |  | 89·79 |  | 3 096 924 |  | 91·61 |  | 526 641 |  | 92·31 |  | 121 597 |  | 93·38 |  | <0·001\* |
|  Urban |  | 65 098 |  | 10·19 |  | 283 377 |  | 8·38 |  | 43 808 |  | 7·68 |  | 8614 |  | 6·61 |  |
|  NA |  | 69 |  | 0·01 |  | 241 |  | <0·01 |  | 31 |  | <0·01 |  | 13 |  | <0·01 |  |
| Alcohol consumption |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 22 897 |  | 3·59 |  | 88 509 |  | 2·62 |  | 13 590 |  | 2·38 |  | 2798 |  | 0·19 |  | <0·001\* |
|  No |  | 612 496 |  | 95·92 |  | 3 277 659 |  | 96·96 |  | 554 618 |  | 97·22 |  | 126 892 |  | 97·44 |  |
|  NA |  | 3174 |  | 0·50 |  | 14 374 |  | 0·43 |  | 2272 |  | 0·40 |  | 534 |  | 0·41 |  |
| Smoking status |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 1575 |  | 0·25 |  | 6147 |  | 0·18 |  | 1392 |  | 0·24 |  | 440 |  | 0·34 |  | <0·001\* |
|  No |  | 634 523 |  | 99·37 |  | 3 363 094 |  | 99·48 |  | 567 287 |  | 99·44 |  | 129 345 |  | 99·33 |  |
|  NA |  | 2469 |  | 0·39 |  | 11 301 |  | 0·33 |  | 1801 |  | 0·32 |  | 439 |  | 0·34 |  |
| Second-hand smoke |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 86 083 |  | 13·48 |  | 359 842 |  | 10·64 |  | 62 578 |  | 10·97 |  | 14 341 |  | 10·32 |  | <0·001\* |
|  No |  | 549 949 |  | 86·12 |  | 3 009 142 |  | 89·01 |  | 506 030 |  | 88·70 |  | 115 434 |  | 88·64 |  |
|  NA |  | 2535 |  | 0·40 |  | 11 558 |  | 0·34 |  | 1872 |  | 0·33 |  | 449 |  | 0·35 |  |
| Hypertension |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 6936 |  | 1·09 |  | 43 972 |  | 1·30 |  | 16 527 |  | 2·89 |  | 8387 |  | 6·44 |  | <0·001\* |
|  No |  | 630 428 |  | 98·72 |  | 3 331 315 |  | 98·54 |  | 553 114 |  | 96·96 |  | 121 644 |  | 93·41 |  |
|  NA |  | 1203 |  | 0·19 |  | 5255 |  | 0·15 |  | 839 |  | 0·15 |  | 193 |  | 0·15 |  |
| Diabetes mellitus |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 5880 |  | 0·92 |  | 28 822 |  | 0·85 |  | 7966 |  | 1·40 |  | 3609 |  | 2·77 |  | <0·001\* |
|  No |  | 631 464 |  | 98·89 |  | 3 346 373 |  | 98·99 |  | 561 650 |  | 98·45 |  | 126 410 |  | 97·07 |  |
|  NA |  | 1223 |  | 0·19 |  | 5347 |  | 0·16 |  | 864 |  | 0·15 |  | 205 |  | 0·16 |  |
| History of adverse pregnancy outcomes |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 100 348 |  | 15·71 |  | 506 041 |  | 14·97 |  | 117 133 |  | 20·53 |  | 29 752 |  | 22·85 |  | <0·001\* |
|  No |  | 535 778 |  | 83·90 |  | 2 864 332 |  | 84·73 |  | 451 927 |  | 79·22 |  | 100 172 |  | 76·92 |  |
|  NA |  | 2441 |  | 0·38 |  | 10 169 |  | 0·30 |  | 1420 |  | 0·25 |  | 300 |  | 0·23 |  |

Abbreviations: BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared), LMP, last menstrual period; NA, missing data.

\* Chi-squared test was conducted to compare the differences of baseline characteristics among different maternal BMI status for categorical variable

Supplemental Table 3 Demographic Characteristics by Paternal preconception Body Mass Index. (n=4 719 813)

|  |  |  |
| --- | --- | --- |
|  |  | Paternal preconception BMI (mIU/L) levels |
|  |  | Underweight (<18·5) |  | Normal weight (18·5-) |  | Overweight (24·0-) |  | Obese (28·0-) |  |  |
| Paternal characteristics |  | n |  | % |  | n |  | % |  | n |  | % |  | n |  | % |  | P Value |
| n |  | 193 747 |  | 2 943 512 |  | 1 248 662 |  | 333 892 |  |  |
| Age at LMP (years) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 20-24·9 |  | 77 293 |  | 39·88 |  | 876 556 |  | 29·78 |  | 288 673 |  | 23·12 |  | 73 934 |  | 22·14 |  | <0·001\* |
| 25-29·9 |  | 87 633 |  | 45·23 |  | 1 367 299 |  | 46·45 |  | 569 770 |  | 45·63 |  | 151 285 |  | 45·31 |  |
| 30-34·9 |  | 20 833 |  | 10·75 |  | 473 188 |  | 16·08 |  | 252 958 |  | 20·26 |  | 73 059 |  | 21·88 |  |
| 35-39·9 |  | 5156 |  | 2·66 |  | 159 749 |  | 5·43 |  | 100 277 |  | 8·03 |  | 27 271 |  | 8·17 |  |
| ≥40 |  | 1368 |  | 0·71 |  | 52 898 |  | 1·80 |  | 33 074 |  | 2·65 |  | 7343 |  | 2·20 |  |
|  NA |  | 1494 |  | 0·77 |  | 13 822 |  | 0·47 |  | 3910 |  | 0·31 |  | 1000 |  | 0·30 |  |
| Height (cm) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  ≤154·9 |  | 567 |  | 0·29 |  | 7513 |  | 0·26 |  | 3331 |  | 0·27 |  | 1711 |  | 0·51 |  | <0·001\* |
|  155-164·9 |  | 28 600 |  | 14·76 |  | 362 677 |  | 12·32 |  | 136 594 |  | 10·94 |  | 35 849 |  | 10·74 |  |
|  165-174·9 |  | 126 107  |  | 65·09 |  | 1 978 311 |  | 67·21 |  | 831 025 |  | 66·55 |  | 200 311 |  | 59·99 |  |
|  ≥175 |  | 35 217 |  | 18·18 |  | 561 789 |  | 19·09 |  | 264 809 |  | 21·21 |  | 92 849 |  | 27·81 |  |
| NA |  | 3256 |  | 1·68 |  | 33 213 |  | 1·13 |  | 12 923 |  | 1·03 |  | 3152 |  | 0·94 |  |
| Education |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  High school or above |  | 30 064 |  | 15·52 |  | 478 520 |  | 16·26 |  | 252 555 |  | 20·23 |  | 67819 |  | 20·31 |  | <0·001\* |
|  Primary school or below |  | 157 737 |  | 81·41 |  | 2 386 413 |  | 81·07 |  | 961 627 |  | 77·01 |  | 257 102 |  | 77·00  |  |
|  NA |  | 5946 |  | 3·07 |  | 78 579 |  | 2·67 |  | 34 480 |  | 2·76 |  | 8971 |  | 2·69 |  |
| Residence |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Rural |  | 176 873 |  | 91·29 |  | 2 689 441 |  | 91·37 |  | 1 096 606 |  | 87·82 |  | 287 324 |  | 86·05 |  | <0·001\* |
|  Urban |  | 16 863 |  | 8·70 |  | 253 887 |  | 8·63 |  | 151 944 |  | 12·17 |  | 46 530 |  | 13·94 |  |
|  NA |  | 11 |  | <0·01 |  | 184 |  | <0·01 |  | 112 |  | <0·01 |  | 38 |  | <0·01 |  |
| Ethnic (Han) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Han |  | 179 611 |  | 92·70 |  | 2 702 766 |  | 91·82 |  | 1 161 109 |  | 92·99 |  | 313 826 |  | 93·99 |  | <0·001\* |
|  NA |  | 2100 |  | 1·08 |  | 28 706 |  | 0·98 |  | 12 273 |  | 0·98 |  | 2993 |  | 0·90 |  |
| Alcohol consumption |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 56 484 |  | 29·15 |  | 775 590 |  | 26·35 |  | 381 127 |  | 30·52 |  | 115 158 |  | 34·49 |  | <0·001\* |
|  No |  | 136 619 |  | 70·51 |  | 2 158 383 |  | 73·33 |  | 863 786 |  | 69·18 |  | 217 750 |  | 65·22 |  |
|  NA |  | 644 |  | 0·33 |  | 9539 |  | 0·32 |  | 3749 |  | 0·30 |  | 984 |  | 0·29 |  |
| Smoking status |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 68 589 |  | 35·40 |  | 760 553 |  | 25·84 |  | 343 754 |  | 27·53 |  | 114 231 |  | 34·21 |  | <0·001\* |
|  No |  | 124 537 |  | 64·28 |  | 2 173 846 |  | 73·85 |  | 901 176 |  | 72·17 |  | 218 645 |  | 65·48 |  |
|  NA |  | 621 |  | 0·32 |  | 9113 |  | 0·31 |  | 3732 |  | 0·30 |  | 1016 |  | 0·30 |  |
| Second-hand smoke |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Yes |  | 52 676 |  | 27·19 |  | 653 256 |  | 22·19 |  | 307 511 |  | 24·63 |  | 92 736 |  | 27·77 |  | <0·001\* |
|  No |  | 140 337 |  | 72·43 |  | 2 279 414 |  | 77·44 |  | 936 654 |  | 75·01 |  | 239 892 |  | 71·85 |  |
|  NA |  | 734 |  | 0·38 |  | 10 842 |  | 0·37  |  | 4497 |  | 0·36 |  | 1264 |  | 0·38 |  |

Abbreviations: BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared), LMP, last menstrual period; NA, missing data.

\* Chi-squared test was conducted to compare the differences of baseline characteristics among different maternal BMI status for categorical variable

Supplemental Table 4 Associations between Maternal/ Paternal Preconception Body Mass Index and Risk of Small/Large for Gestational Age Infant (Odds Ratios and 95% Confidence Intervals). (n=4 719 813)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome ( SGA/LGA )** |  | **No·of** |  | **Outcome ( SGA / LGA ) cases** |  | **Age-adjusted** |  | **Multivariate-adjusted** |
| **Maternal/Paternal BMI** |  | **participants** |  | **n** |  | **%** |  | **OR** |  | **95% CI** |  | **OR** |  | **95% CI** |
| **SGA vs AGA** |  | 4 719 813 |  | 256 718 |  | 5·44 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 638 567 |  | 48 569 |  | 7·61 |  | 1·45\* |  | 1·43, 1·46 |  | 1·36‡ |  | 1·35, 1·38 |
|  Normal weight (18·5-) |  | 3 380 542 |  | 178 576 |  | 5·28 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 570 480 |  | 24 287 |  | 4·25 |  | 0·82\* |  | 0·81, 0·83 |  | 0·85‡ |  | 0·84, 0·87 |
|  Obese (28·0-) |  | 130 224 |  | 5286 |  | 4·06 |  | 0·80\* |  | 0·77, 0·82 |  | 0·84‡ |  | 0·81, 0·86 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 193 747 |  | 13 679 |  | 7·06 |  | 1·27† |  | 1·24, 1·29 |  | 1·17§ |  | 1·15, 1·19 |
|  Normal weight (18·5-) |  | 2 943 512 |  | 165 924 |  | 5·64 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 1 248 662 |  | 62 129 |  | 4·98 |  | 0·89† |  | 0·88, 0·89 |  | 0·92§ |  | 0·90, 0·93 |
|  Obese (28·0-) |  | 333 892 |  | 14 986 |  | 4·49 |  | 0·82† |  | 0·80, 0·83 |  | 0·87§ |  | 0·85, 0·88 |
| **LGA vs AGA** |  | 4 719 813 |  | 506 495 |  | 10·73 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 638 567 |  | 55 532 |  | 8·70 |  | 0·84\* |  | 0·83, 0·85 |  | 0·87‡ |  | 0·86, 0·88 |
|  Normal weight (18·5-) |  | 3 380 542 |  | 354 306 |  | 10·48 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 570 480 |  | 76 784 |  | 13·46 |  | 1·30\* |  | 1·29, 1·32 |  | 1·25‡ |  | 1·24, 1·26 |
|  Obese (28·0-) |  | 130 224 |  | 19 873 |  | 15·26 |  | 1·51\* |  | 1·49, 1·53 |  | 1·42‡ |  | 1·40, 1·45 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 193 747 |  | 18 054 |  | 9·32 |  | 0·92† |  | 0·91, 0·94 |  | 0.94§ |  | 0·93, 0·96 |
|  Normal weight (18·5-) |  | 2 943 512 |  | 301 541 |  | 10·24 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 1 248 662 |  | 143 198 |  | 11·47 |  | 1·12† |  | 1·11, 1·12 |  | 1·08§ |  | 1·06, 1·09 |
|  Obese (28·0-) |  | 333 892 |  | 43 702 |  | 13·09 |  | 1·28† |  | 1·27, 1·30 |  | 1·19§ |  | 1·17, 1·20 |

Abbreviations: SGA, small for gestational age infant; LGA, large for gestational age infant; AGA, appropriate for gestational age infant; OR, odds ratios, BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared).

\* † Models were adjusted for maternal and paternal age at last menstrual period.

‡ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and paternal BMI, maternal hypertension, diabetes, parity as well as history of adverse pregnancy.

§ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and maternal BMI, hypertension, diabetes, parity as well as history of adverse pregnancy.

Supplemental Table 5 Adjusted ORs of Small/Large for Gestational Age Infant According to Body Mass Index of Couples. (n=4 719 813)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome (SGA/LGA)**  |  | **No·of** |  | **outcome (SGA/LGA) cases** |  | **Age-adjusted** |  | **Multivariate-adjusted** |
|  **Maternal : Paternal BMI** |  | **participants** |  | **n** |  | **%** |  | **OR** |  | **95% CI** |  | **OR**  |  | **95% CI** |
| **SGA vs AGA** |  | 4 719 813 |  | 256 718 |  | 5·44 |  |  |  |  |  |  |  |  |
|  **Maternal BMI: Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight: Underweight |  | 45 058 |  | 4117 |  | 9·14 |  | 1·73\* |  | 1·67, 1·79 |  | 1·58‡ |  | 1·52, 1·63 |
|  Underweight: Normal weight |  | 410 660 |  | 31 441 |  | 7·65 |  | 1·42\* |  | 1·40, 1·44 |  | 1·35‡ |  | 1·33, 1·37 |
|  Underweight: Overweight & Obese |  | 182 894 |  | 13 011 |  | 7·11 |  | 1·32\* |  | 1·29, 1·34 |  | 1·28‡ |  | 1·25, 1·31 |
|  Normal weight: Underweight |  | 127 682 |  | 8504 |  | 6·66 |  | 1·24\* |  | 1·22, 1·27 |  | 1·18‡ |  | 1·15, 1·21 |
|  Normal weight: Normal weight |  | 2 164 948 |  | 118 081 |  | 5·45 |  | 1·00 |  | 1·00 |
|  Normal weight: Overweight & Obese  |  | 1 087 912 |  | 51 991 |  | 4·78 |  | 0·88\* |  | 0·87, 0·89 |  | 0·91‡ |  | 0·90, 0·92 |
|  Overweight & Obese: Underweight |  | 21 007 |  | 1508 |  | 7·18 |  | 0·94\* |  | 0·88, 0·99 |  | 0·89‡ |  | 0·84, 0·95 |
|  Overweight & Obese: Normal weight |  | 367 904 |  | 16 402 |  | 4·46 |  | 0·83\* |  | 0·81, 0·84 |  | 0·84‡ |  | 0·83, 0·85 |
|  Overweight & Obese: Overweight & Obese  |  | 311 793 |  | 12 113 |  | 3·88 |  | 0·73\* |  | 0·72, 0·75 |  | 0·78‡ |  | 0·76, 0·79 |
| **LGA vs AGA** |  | 4 719 813 |  | 506 495 |  | 10·73 |  |  |  |  |  |  |  |  |
|  **Maternal BMI: Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight: Underweight |  | 45 058 |  | 3560 |  | 7·90 |  | 0·80**†** |  | 0·77, 0·83 |  | 0·83§ |  | 0·80, 0·86 |
|  Underweight: Normal weight |  | 410 660 |  | 35 383 |  | 8·62 |  | 0·87**†** |  | 0·86, 0·88 |  | 0·89§ |  | 0·88, 0·90 |
|  Underweight: Overweight & Obese |  | 182 894 |  | 16 589 |  | 9·07 |  | 0·91**†** |  | 0·89, 0·92 |  | 0·92§ |  | 0·90, 0·93 |
|  Normal weight: Underweight |  | 127 682 |  | 12 091 |  | 9·50 |  | 0·95**†** |  | 0·92, 0·96 |  | 0·96§ |  | 0·94, 0·98 |
|  Normal weight: Normal weight |  | 2 164 948 |  | 218 178 |  | 10·07 |  | 1·00 |  | 1·00 |
|  Normal weight: Overweight & Obese  |  | 1 087 912 |  | 124 037 |  | 11·40 |  | 1·13**†** |  | 1·12, 1·14 |  | 1·11§ |  | 1·10, 1·12 |
|  Overweight & Obese: Underweight |  | 21 007 |  | 2403 |  | 11·44 |  | 1·15**†** |  | 1·09, 1·20 |  | 1·13§ |  | 1·08, 1·18 |
|  Overweight & Obese: Normal weight |  | 367 904 |  | 47 980 |  | 13·04 |  | 1·32**†** |  | 1·31, 1·33 |  | 1·28§ |  | 1·27, 1·30 |
|  Overweight & Obese: Overweight & Obese  |  | 311 793 |  | 46 274 |  | 14·84 |  | 1·51**†** |  | 1·50, 1·53 |  | 1·43§ |  | 1·42, 1·45 |

Abbreviations: SGA, small for gestational age infant; LGA, large for gestational age infant; AGA, appropriate for gestational age infant; OR, odds ratios, BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared).

\* † Models were adjusted for maternal and paternal age at last menstrual period.

‡ § Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and maternal hypertension, diabetes, parity as well as history of adverse pregnancy

Supplemental Table 6 Distribution of Maternal preconception Body Mass Index Category According to Paternal preconception Body Mass Index. (n=4 719 813)

|  |  |  |
| --- | --- | --- |
|  |  | Paternal BMI |
|  |  | Underweight (<18·5) |  | Normal weight (18·5-) |  | Overweight (24·0-) |  | Obese (28·0-) |  | P Value |
|  |  | n |  | %/IQR/SD |  | n  |  | %/IQR/SD |  | n |  | %/IQR/SD |  | n |  | %/IQR/SD |  |  |
| n |  | 193 747 |  | 2 943 512 |  | 1 248 662 |  | 333 892 |  |  |
| Maternal BMI |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n(%) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | < 0·001\* |
| Underweight (<18·5) |  | 45058  |  | 23·25 |  | 410660 |  | 13·95 |  | 148287 |  | 11·88 |  | 34562 |  | 10·35 |  |  |
| Normal weight (18·5-) |  | 127682  |  | 65·90 |  | 2164948 |  | 73·55 |  | 869714 |  | 69·65 |  | 218198 |  | 65·35 |  |  |
| Overweight (24·0-) |  | 17011  |  | 8·78 |  | 303730 |  | 10·32 |  | 188399 |  | 15·09 |  | 61340 |  | 18·37 |  |  |
| Obese (28·0-) |  | 3996  |  | 2·06 |  | 64174 |  | 2·18 |  | 42262 |  | 3·38 |  | 19792 |  | 5·93 |  |  |
| median (IQR) |  | 20·03 |  | 18·67-22·30 |  | 20·81 |  | 19·43-22·55 |  | 21·26 |  | 19·53-23·40 |  | 21·60 |  | 19·81-23·88 |  | < 0·001† |
| mean (SD) |  | 20·58 |  | 2·86 |  | 21·15 |  | 2·73 |  | 21·66 |  | 2·99 |  | 22·17 |  | 3·37 |  | < 0·001† |

Data are n (%), median (IQR) or mean (SD).

Abbreviations: IQR, inter-quartile range; SD, standard deviations; BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared).

\* Chi-squared test was conducted to compare the differences of baseline characteristics among different maternal BMI status for categorical variable.

† Kruskal-Wallis H test was conducted to compare the differences of baseline characteristics among different paternal BMI status for continuous variables.

Supplemental Table 7 Associations between Maternal/ Paternal Preconception Body Mass Index and Risk of Small/Large for Gestational Age Infant According to WHO Criteria of BMI (Odds Ratios and 95% Confidence Intervals). (n=4 719 813)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome ( SGA/LGA )** |  | **No·of** |  | **Outcome ( SGA / LGA ) cases** |  | **Age-adjusted** |  | **Multivariate-adjusted** |
| **Maternal/Paternal BMI** |  | **participants** |  | **n** |  | **%** |  | **OR** |  | **95% CI** |  | **OR** |  | **95% CI** |
| **SGA vs AGA** |  | 4 719 813 |  | 256 718 |  | 5·44 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 638 567 |  | 48 569 |  | 7·61 |  | 1·47\* |  | 1·45, 1·48 |  | 1·37‡ |  | 1·36, 1·39 |
|  Normal weight (18·5-) |  | 3 639 517 |  | 189 862 |  | 5·22 |  | 1·00 |  | 1·00 |
|  Overweight (25·0-) |  | 383 909 |  | 15 891 |  | 4·14 |  | 0·81\* |  | 0·80, 0·83 |  | 0·85‡ |  | 0·84, 0·87 |
|  Obese (30·0-) |  | 57 820 |  | 2396 |  | 4·14 |  | 0·82\* |  | 0·79, 0·86 |  | 0·85‡ |  | 0·82, 0·89 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 193 747 |  | 13 679 |  | 7·06 |  | 1·28† |  | 1·26, 1·31 |  | 1·18§ |  | 1·15, 1·20 |
|  Normal weight (18·5-) |  | 3 431 543 |  | 190 753 |  | 5·56 |  | 1·00 |  | 1·00 |
|  Overweight (25·0-) |  | 956 990 |  | 46 273 |  | 4·84 |  | 0·88† |  | 0·87, 0·89 |  | 0·91§ |  | 0·90, 0·92 |
|  Obese (30·0-) |  | 137 533 |  | 6013 |  | 4·37 |  | 0·82† |  | 0·80, 0·84 |  | 0·87§ |  | 0·85, 0·90 |
| **LGA vs AGA** |  | 4 719 813 |  | 506 495 |  | 10·73 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 638 567 |  | 55 532 |  | 8·70 |  | 0·83\* |  | 0·82, 0·84 |  | 0·86‡ |  | 0·85, 0·87 |
|  Normal weight (18·5-) |  | 3 639 517 |  | 387 631 |  | 10·65 |  | 1·00 |  | 1·00 |
|  Overweight (25·0-) |  | 383 909 |  | 54 343 |  | 14·15 |  | 1·36\* |  | 1·34, 1·37 |  | 1·29‡ |  | 1·27, 1·30 |
|  Obese (30·0-) |  | 57 820 |  | 8989 |  | 15·55 |  | 1·52\* |  | 1·49, 1·56 |  | 1·44‡ |  | 1·41, 1·48 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18.5) |  | 193 747 |  | 18 054 |  | 9·32 |  | 0·91† |  | 0·90, 0·93 |  | 0.94§ |  | 0·92, 0·95 |
|  Normal weight (18.5-) |  | 3 431 543 |  | 355 676 |  | 10·36 |  | 1·00 |  | 1·00 |
|  Overweight (25.0-) |  | 956 990 |  | 114 066 |  | 11·92 |  | 1·15† |  | 1·14, 1·16 |  | 1·10§ |  | 1·09, 1·11 |
|  Obese (30.0-) |  | 137 533 |  | 18 699 |  | 13·60 |  | 1·32† |  | 1·30, 1·35 |  | 1·22§ |  | 1·20, 1·24 |

Abbreviations: SGA, small for gestational age infant; LGA, large for gestational age infant; AGA, appropriate for gestational age infant; OR, odds ratios, BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared).

\* † Models were adjusted for maternal and paternal age at last menstrual period.

‡ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and paternal BMI, maternal hypertension, diabetes, parity as well as history of adverse pregnancy.

§ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and maternal BMI, hypertension, diabetes, parity as well as history of adverse pregnancy.

Supplemental Table 8 Adjusted ORs of Small/Large for Gestational Age Infant According to Body Mass Index of Couples (WHO Criteria of BMI, n=4 719 813)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome (SGA/LGA)**  |  | **No·of** |  | **outcome (SGA/LGA) cases** |  | **Age-adjusted** |  | **Multivariate-adjusted** |
|  **Maternal : Paternal BMI** |  | **participants** |  | **n** |  | **%** |  | **OR** |  | **95% CI** |  | **OR**  |  | **95% CI** |
| **SGA vs AGA** |  | 4 719 813 |  | 256 718 |  | 5·44 |  |  |  |  |  |  |  |  |
|  **Maternal BMI: Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight: Underweight |  | 45 058 |  | 4117 |  | 9·14 |  | 1·77\* |  | 1·71, 1·83 |  | 1·61‡ |  | 1·55, 1·66 |
|  Underweight: Normal weight |  | 468 587 |  | 35 653 |  | 7·61 |  | 1·44\* |  | 1·43, 1·46 |  | 1·37‡ |  | 1·35, 1·39 |
|  Underweigh: Overweight & Obese |  | 124 922 |  | 8799 |  | 7·04 |  | 1·33\* |  | 1·30, 1·36 |  | 1·29‡ |  | 1·26, 1·32 |
|  Normal weight: Underweight |  | 135 430 |  | 8900 |  | 6·57 |  | 1·26\* |  | 1·23, 1·28 |  | 1·19‡ |  | 1·16, 1·21 |
|  Normal weight: Normal weight |  | 2 688 450 |  | 143 199 |  | 5·33 |  | 1·00 |  | 1·00 |
|  Normal weight: Overweight & Obese  |  | 815 637 |  | 37 763 |  | 4·63 |  | 0·88\* |  | 0·87, 0·89 |  | 0·91‡ |  | 0·89, 0·92 |
|  Overweight & Obese: Underweight |  | 13 259 |  | 662 |  | 4·99 |  | 0·95\* |  | 0·88, 1·03 |  | 0·92‡ |  | 0·84, 0·99 |
|  Overweight & Obese: Normal weight |  | 274 506 |  | 11 901 |  | 4·34 |  | 0·83\* |  | 0·81, 0·85 |  | 0·85‡ |  | 0·83, 0·86 |
|  Overweight & Obese: Overweight & Obese  |  | 153 964 |  | 5724 |  | 3·72 |  | 0·72\* |  | 0·71, 0·74 |  | 0·77‡ |  | 0·75, 0·80 |
| **LGA vs AGA** |  | 4 719 813 |  | 506 495 |  | 10·73 |  |  |  |  |  |  |  |  |
|  **Maternal BMI: Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight: Underweight |  | 45 058 |  | 3560 |  | 7·90 |  | 0·78**†** |  | 0·76, 0·81 |  | 0·81§ |  | 0·78, 0·84 |
|  Underweight: Normal weight |  | 468 587 |  | 40 551 |  | 8·65 |  | 0·85**†** |  | 0·84, 0·86 |  | 0·87§ |  | 0·86, 0·88 |
|  Underweight: Overweight & Obese |  | 124 922 |  | 11 421 |  | 7·68 |  | 0·89**†** |  | 0·88, 0·91 |  | 0·90§ |  | 0·88, 0·92 |
|  Normal weight: Underweight |  | 135 430 |  | 12 937 |  | 9·14 |  | 0·93**†** |  | 0·92, 0·95 |  | 0·95§ |  | 0·93, 0·96 |
|  Normal weight: Normal weight |  | 2 688 450 |  | 277 445 |  | 10·32 |  | 1·00 |  | 1·00 |
|  Normal weight: Overweight & Obese  |  | 815 637 |  | 97 249 |  | 11·92 |  | 1·16**†** |  | 1·15, 1·17 |  | 1·13§ |  | 1·12, 1·14 |
|  Overweight & Obese: Underweight |  | 13 259 |  | 1557 |  | 11·74 |  | 1·16**†** |  | 1·10, 1·22 |  | 1·15§ |  | 1·07, 1·19 |
|  Overweight & Obese: Normal weight |  | 274 506 |  | 37 680 |  | 13·73 |  | 1·36**†** |  | 1·35, 1·38 |  | 1·32§ |  | 1·30, 1·33 |
|  Overweight & Obese: Overweight & Obese  |  | 153 964 |  | 24 095 |  | 15·65 |  | 1·57**†** |  | 1·54, 1·59 |  | 1·47§ |  | 1·45, 1·50 |

Abbreviations: SGA, small for gestational age infant; LGA, large for gestational age infant; AGA, appropriate for gestational age infant; OR, odds ratios, BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared).

\* † Models were adjusted for maternal and paternal age at last menstrual period.

‡ § Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and maternal hypertension, diabetes, parity as well as history of adverse pregnancy.

Supplemental Table 9 Associations between Maternal/ Paternal Preconception Body Mass Index and Risk of Small/Large for Gestational Age Infant According to INTERGROWTH-21st Criteria (Odds Ratios and 95% Confidence Intervals). (n=4 583 911)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome ( SGA/LGA )** |  | **No·of** |  | **Outcome ( SGA / LGA ) cases** |  | **Age-adjusted** |  | **Multivariate-adjusted** |
| **Maternal/Paternal BMI** |  | **participants** |  | **n** |  | **%** |  | **OR** |  | **95% CI** |  | **OR** |  | **95% CI** |
| **SGA vs AGA** |  | 4 583 911 |  | 146 362 |  | 3·19 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 620 655 |  | 26 871 |  | 4·33 |  | 1·36\* |  | 1·34, 1·38 |  | 1·30‡ |  | 1·28, 1·31 |
|  Normal weight (18·5-) |  | 3 283 681 |  | 102 204 |  | 3·11 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 553 402 |  | 14 131 |  | 2·55 |  | 0·86\* |  | 0·85, 0·88 |  | 0·89‡ |  | 0·87, 0·91 |
|  Obese (28·0-) |  | 126 173 |  | 3156 |  | 2·50 |  | 0·85\* |  | 0·83, 0·89 |  | 0·90‡ |  | 0·87, 0·93 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 187 991 |  | 7679 |  | 4·08 |  | 1·22† |  | 1·19, 1·25 |  | 1·14§ |  | 1·12, 1·17 |
|  Normal weight (18·5-) |  | 2 857 815 |  | 94 692 |  | 3·31 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 1 213 498 |  | 35 414 |  | 2·92 |  | 0·90† |  | 0·89, 0·92 |  | 0·93§ |  | 0·92, 0·95 |
|  Obese (28·0-) |  | 324 607 |  | 8577 |  | 2·64 |  | 0·85† |  | 0·83, 0·87 |  | 0·90§ |  | 0·88, 0·92 |
| **LGA vs AGA** |  | 4 583 911 |  | 705 439 |  | 15·39 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 620 655 |  | 76 305 |  | 12·29 |  | 0·81\* |  | 0·80, 0·82 |  | 0·84‡ |  | 0·83, 0·85 |
|  Normal weight (18·5-) |  | 3 283 681 |  | 495 202 |  | 15·08 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 553 402 |  | 106 797 |  | 19·30 |  | 1·32\* |  | 1·31, 1·33 |  | 1·26‡ |  | 1·25, 1·27 |
|  Obese (28·0-) |  | 126 173 |  | 27 135 |  | 21·51 |  | 1·52\* |  | 1·50, 1·54 |  | 1·43‡ |  | 1·41, 1·45 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 187 991 |  | 24 447 |  | 13·00 |  | 0·89† |  | 0·88, 0·90 |  | 0.92§ |  | 0·91, 0·94 |
|  Normal weight (18·5-) |  | 2 857 815 |  | 416 626 |  | 14·58 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 1 213 498 |  | 202 355 |  | 16·68 |  | 1·15† |  | 1·15, 1·16 |  | 1·11§ |  | 1·10, 1·12 |
|  Obese (28·0-) |  | 324 607 |  | 62 011 |  | 19·10 |  | 1·35† |  | 1·33, 1·36 |  | 1·24§ |  | 1·23, 1·25 |

Abbreviations: SGA, small for gestational age infant; LGA, large for gestational age infant; AGA, appropriate for gestational age infant; OR, odds ratios, BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared).

\* † Models were adjusted for maternal and paternal age at last menstrual period.

‡ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and paternal BMI, maternal hypertension, diabetes, parity as well as history of adverse pregnancy.

§ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and maternal BMI, hypertension, diabetes, parity as well as history of adverse pregnancy.

Supplemental Table 10 Sensitivity Analysis of Associations between Maternal/ Paternal Preconception Body Mass Index and Risk of Small/Large for Gestational Age Infant after Excluding Participants with Missing Data on Baseline Characteristics (Odds Ratios and 95% Confidence Intervals). (n=4 463 361)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Outcome ( SGA/LGA )** |  | **No·of** |  | **Outcome ( SGA / LGA ) cases** |  | **Age-adjusted** |  | **Multivariate-adjusted** |
| **Maternal/Paternal BMI** |  | **participants** |  | **n** |  | **%** |  | **OR** |  | **95% CI** |  | **OR** |  | **95% CI** |
| **SGA vs AGA** |  | 4 463 361 |  | 239 705 |  | 5·37 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 594 778 |  | 44 643 |  | 7·51 |  | 1·45\* |  | 1·43, 1·47 |  | 1·36‡ |  | 1·35, 1·38 |
|  Normal weight (18·5-) |  | 3 200 019 |  | 167 143 |  | 5·22 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 543 921 |  | 22 915 |  | 4·21 |  | 0·82\* |  | 0·81, 0·83 |  | 0·85‡ |  | 0·84, 0·87 |
|  Obese (28·0-) |  | 124 643 |  | 5004 |  | 4·01 |  | 0·79\* |  | 0·77, 0·82 |  | 0·84‡ |  | 0·81, 0·86 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 181 353 |  | 12 685 |  | 6·99 |  | 1·27† |  | 1·25, 1·30 |  | 1·17§ |  | 1·15, 1·19 |
|  Normal weight (18·5-) |  | 2 784 449 |  | 155 088 |  | 5·57 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 1 181 213 |  | 57 970 |  | 4·91 |  | 0·89† |  | 0·88, 0·90 |  | 0·92§ |  | 0·91, 0·93 |
|  Obese (28·0-) |  | 316 346 |  | 13 962 |  | 4·41 |  | 0·82† |  | 0·80, 0·83 |  | 0·87§ |  | 0·85, 0·89 |
| **LGA vs AGA** |  | 4 463 361 |  | 482 268 |  | 10·81 |  |  |  |  |  |  |  |  |
|  **Maternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 594 778 |  | 52 474 |  | 8·82 |  | 0·85\* |  | 0·84, 0·86 |  | 0·87‡ |  | 0·86, 0·88 |
|  Normal weight (18·5-) |  | 3 200 019 |  | 337 331 |  | 10·54 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 543 921 |  | 73 401 |  | 13·49 |  | 1·30\* |  | 1·29, 1·31 |  | 1·25‡ |  | 1·24, 1·26 |
|  Obese (28·0-) |  | 124 643 |  | 19 062 |  | 15·29 |  | 1·51\* |  | 1·48, 1·53 |  | 1·42‡ |  | 1·40, 1·45 |
|  **Paternal BMI** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  Underweight (<18·5) |  | 181 353 |  | 17 037 |  | 9·39 |  | 0·92† |  | 0·31, 0·94 |  | 0.94§ |  | 0·93, 0·96 |
|  Normal weight (18·5-) |  | 2 784 449 |  | 287 215 |  | 10·31 |  | 1·00 |  | 1·00 |
|  Overweight (24·0-) |  | 1 181 213 |  | 136 397 |  | 11·55 |  | 1·12† |  | 1·11, 1·13 |  | 1·08§ |  | 1·07, 1·09 |
|  Obese (28·0-) |  | 316 346 |  | 41 619 |  | 13·16 |  | 1·28† |  | 1·27, 1·30 |  | 1·19§ |  | 1·18, 1·21 |

Abbreviations: SGA, small for gestational age infant; LGA, large for gestational age infant; AGA, appropriate for gestational age infant; OR, odds ratios, BMI, body mass index (calculated as the weight in kilograms divided by height in meters squared).

\* † Models were adjusted for maternal and paternal age at last menstrual period.

‡ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and paternal BMI, maternal hypertension, diabetes, parity as well as history of adverse pregnancy.

§ Models were adjusted for maternal and paternal age at LMP, height, ethnic, education, area of residence, alcohol drinking, smoking, passive smoking and maternal BMI, hypertension, diabetes, parity as well as history of adverse pregnancy.