Supplement 1. Sociodemographic characteristics

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables  | Grade 7(*n*: 7975)  | Grade 8(*n*: 7723) | Grade 9(*n*: 8014) | Grade 10(*n*: 7498) | Grade 11(*n*: 7242) | Grade 12(*n*: 7754) | χ2 or *F* | *p*-value |
| Age, years | 12.50±0.51 | 13.52± 0.52 | 14.51± 0.52 | 15.51± 0.52 | 16.50± 0.52 | 17.47± 0.52 |  |  |
| Gender Male Female | 4096 (51.4)3879 (48.6) | 3920 (50.8)3803 (49.2) | 4149 (51.8)3865 (48.2) | 3879 (51.7)3619 (48.3) | 3698 (51.1)3544 (48.9) | 4031 (52.0)3723 (48.0) | 3.41 | 0.637 |
| Size of the city Big Medium Small  | 3476 (43.6)3880 (48.7)619 (7.8) | 3334 (43.2)3774 (48.9)615 (8.0) | 3502 (43.7)3917 (48.9)595 (7.4) | 3408 (45.5)3489 (46.5)601 (8.0) | 3248 (44.8)3427 (47.3)567 (7.8) | 3564 (46.0)3596 (46.4)594 (7.7) | 24.65 | 0.006 |
| School type  Coed school Boys school Girls school  | 5878 (73.7)1079 (13.5)1018 (12.8) | 5664 (73.3)1074 (13.9)985 (12.8) | 5900 (73.6)1095 (13.7)1019 (12.7) | 4377 (58.4)1532 (20.4)1589 (21.2) | 4204 (48.1)1498 (20.7)154 (21.3) | 4491 (57.9)1604 (20.7)1659 (21.4) | 1238.48 | < 0.01 |
| Perceived academic performance UpperUpper middleMiddle Lower middle Lower | 1468 (18.4)2493 (31.3)2509 (31.5)1143 (14.3)362 (4.5) | 1183 (15.3)2068 (26.8)2238 (29.0)1616 (20.9)618 (8.0) | 1323 (16.5)2083 (26.0)2093 (26.1)1768 (22.1)747 (9.3) | 737 (9.8)1753 (23.4)2343 (31.2)1861 (24.8)804 (10.7) | 702 (9.7)1665 (23.0)2379 (32.9)1773 (24.5)723 (10.0) | 829 (10.7)1857 (23.9)2521 (32.5)1844 (23.8)703 (9.1) | 1137.55 | < 0.01 |
| Multicultural familya YesNo | 170 (2.8)5803 (97.2) | 130 (2.4)5213 (97.6) | 103 (1.9)5213 (98.1) | 62 (1.3)4617 (98.7) | 58 (1.3)4256 (98.7) | 57 (1.3)4371 (98.7) | 60.16 | < 0.01 |
| Type of residence,  Living with parents Living with relativesLiving aloneLiving in a dormitoryLiving in a childcare facility | 7813 (98.0)42 (0.5)11 (0.1)91 (1.1)18 (0.2) | 7599 (98.4)28 (0.4)15 (0.2)61 (0.8)20 (0.3) | 7884 (98.4)28 (0.3)19 (0.2)57 (0.7)26 (0.3) | 6799 (90.7)35 (0.5)36 (0.5)606 (8.1)22 (0.3) | 6660 (92.0)39 (0.5)60 (0.8)463 (6.4)20 (0.3) | 7147 (92.2)38 (0.5)67 (0.9)479 (6.2)23 (0.3) | 1289.57 | < 0.01 |
| Perceived economic status UpperUpper middleMiddle Lower middle Lower | 1303 (16.3)2635 (33.0)3425 (42.9)542 (6.8)70 (0.9) | 965 (12.5)2350 (30.4)3638 (47.1)661 (8.6) 109 (1.4) | 874 (10.9)2344 (29.2)392 (48.8)751 (9.4)133 (1.7) | 652 (8.7)2071 (27.6)3761 (50.2)842 (11.2)172 (2.3) | 597 (8.2)1894 (26.2)3615 (49.9)933 (12.9)203 (2.8) | 578 (7.5)1946 (25.1)3952 (51.0)1055 (13.6)223 (2.9) | 975.18 | < 0.05 |
| Physical activityd, days | 3.32±2.21 | 3.26±2.16  | 3.20±2.19 | 2.83±2.02 | 2.84±2.01 | 2.69±2.00 | 124.576 | < 0.01 |
| Time for studying (WDb), min | 376.68±242.87 | 415.80±242.87 | 425.80±237.63 | 520.05±263.81 | 516.83±251.16 | 550.70±252.37 | 605.67 | < 0.01 |
| Time for studying (WKc), min | 148.56±155.73 | 186.37±178.95 | 191.13±187.34 | 266.74±225.93 | 276.76±232.38 | 339.08±266.73 | 871.87 | < 0.01 |
| Time for Internet use (WDb), min | 111.75±112.57 | 122.82±122.45 | 117.96±120.20 | 104.29±109.48 | 103.07±110.23 | 97.73±105.12 | 55.16 | < 0.01 |
| Time for Internet use (WKc), min | 186.55±163.00 | 208.39±174.33 | 202.43±176.93 | 189.43±161.08 | 174.93±161.61 | 163.74±152.89 | 78.37 | < 0.01 |
| Dietary behaviorse, dayse | 5.28±2.74  | 5.04±2.75 | 4.95±2.77 | 5.02±2.68 | 4.83±2.68 | 5.01±2.70 | 21.96 | < 0.01 |
| Perceived health status Very healthy HealthySo soUnhealthyVery unhealthy | 2438 (30.6)3736 (46.8)1528 (19.2)263 (3.3)10 (0.1) | 2134 (27.6)3544 (45.9)1667 (21.6)358 (4.6)20 (0.3) | 2292 (28.6)3527 (44.0)1715 (21.4)455 (5.7)25 (0.3) | 1932 (25.8)3401 (45.4)1604 (21.4)532 (7.1)29 (0.4) | 1714 (23.7)3151 (43.5)1753 (24.2)575 (7.9)49 (0.7) | 1860 (24.0)3200 (41.3)1933 (24.9)712 (9.2)49 (0.6) | 560.04 | < 0.01 |
| Body perception Very skinnySkinnySo soObeseVery obese | 332 (4.2)1802 (22.6)2944 (37.5)2395 (30.0)452 (5.7) | 336 (4.4)1756 (22.7)2898 (37.5)2309 (29.9)424 (5.5) | 359 (4.5)1770 (22.1)2965 (37.0)2465 (30.8)455 (5.7) | 341 (4.5)1582 (21.1)2680 (35.7)2399 (32.0)496 (6.6) | 293 (4.0)1465 (20.2)2572 (35.5)2682 (34.6)514 (7.1) | 285 (3.7)1480 (19.1)2727 (35.2)2682 (34.6)580 (7.5) | 145.23 | < 0.01 |
| Effort to control weight No Weight loss Weight gain Weight maintenance  | 3553 (44.6)2581 (32.4)561 (7.0)1280 (16.1) | 3577 (46.3)2610 (33.8)536 (6.9)1000 (12.9) | 3648 (45.5)2752 (34.3)655 (8.2)959 (12.0) | 3618 (48.3)2499 (33.3)572 (7.6)809 (10.8) | 3431 (47.4)2547 (35.2)537 (7.4)727 (10.0) | 4016 (51.8)2352 (30.3)519 (6.7)867 (11.2) | 250.42 | < 0.01 |
| Alcohol use+, yes  | 1499 (18.8) | 1951 (25.3) | 2628 (32.8) | 3052 (40.7) | 3692 (51.0) | 4549 (58.7) | 3832.16 | < 0.01 |
| Smoking+, yes | 200 (2.5) | 551 (7.1) | 926 (11.6) | 1082 (14.4) | 1335 (18.4) | 1527 (19.7) | 1595.40 | < 0.01 |
| Substance use+, yes | 41 (0.5) | 67 (0.9) | 68 (0.8) | 48 (0.6) | 43 (0.6) | 57 (0.7) | 11.31 | 0.046 |
| Sexual behavior+, yes | 121 (1.5) | 172 (2.2) | 276 (3.4) | 374 (5.0) | 549 (7.6) | 770 (9.9) | 884.35 | < 0.01 |
| Violencef, yes | 131 (1.6) | 166 (2.1) | 157 (2.0) | 103 (1.4) | 136 (1.9) | 135 (1.7) | 15.76 | < 0.01 |
| Perceived stress status Very much A lotA littleNot muchNot at all | 643 (8.1)2021 (25.3)3276 (41.1)1625 (20.4)410 (5.1) | 754 (9.8)2156 (27.9)3204 (41.5)1307 (16.9)302 (3.9) | 820 (10.2)2143 (26.7)3407 (42.5)1353 (16.9)291 (3.6) | 822 (11.0)2166 (28.9)3203 (42.7)1044 (13.9)263 (3.5) | 874 (12.1)2175 (30.0)2991 (41.3)989 (13.7)213 (2.9) | 976 (12.6)2264 (29.2)3223 (41.6)1057 (13.6)234 (3.0) | 388.48 | < 0.01 |
| Depressive episode | 1752 (22.0) | 2075 (26.9) | 2228 (27.8) | 1993 (26.6) | 2024 (27.9) | 2294 (29.6) | 134.79 | < 0.01 |

Each number is presented as mean±standard deviation or sample size (ratio by group). Multicultural familya: those whose father or mother was not born in South Korea WDb: weekday, WKc: weekend, Physical activityd, days: Number of days of physical activity for at least 60 minutes per day of the week, Dietary behaviors, dayse: Number of days of having breakfast of the week, +**:** lifetime experience, Violencef: Experience of being treated by doctor due to violence

Supplement 2. Logistic regression analyses of factors associated with depressive episode

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | Unadjusted Model |  | Adjusted Model\* |
| OR  | 95% Cl for OR  | p-value |  | OR  | 95% Cl for OR  | p-value |
| GenderBoysGirls | 11.879 | 1.802 | 1.959 | < 0.001 |  | 1.998 | 1.881 | 2.122 | < 0.001 |
| City type SmallBig Medium | 10.9871.058 | 0.9110.977 | 1.0701.146 | 0.7510.165 |  |  |  |  |  |
| School typeCoed Boys Girls  | 10.6351.197 | 0.5971.134 | 0.6751.263 | < 0.001< 0.001 |  | 10.8520.881 | 0.7920.827 | 0.9160.939 | < 0.001< 0.001 |
| School grade Middle 1st grade Middle 2nd grade Middle 3rd grade High 1st gradeHigh 2nd gradeHigh 3rd grade  | 11.3051.3681.2861.3781.492 | 1.2131.2731.1951.2801.389 | 1.4041.4701.3841.4831.604 | < 0.001< 0.001< 0.001< 0.001< 0.001 |  | 11.1231.0980.9240.8670.886 | 1.0381.0150.8490.7950.812 | 1.2151.1881.0060.9450.966 | < 0.01< 0.050.067< 0.01< 0.01 |
| Perceived academic performanceUpperUpper middleMiddle Lower middle Lower | 11.1751.2341.6162.113 | 1.0921.1501.5011.935 | 1.2651.3261.7402.309 | < 0.001< 0.001< 0.001< 0.001 |  | 11.0971.1241.3171.583 | 1.0131.0391.2111.429 | 1.1881.2171.4331.753 | < 0.05< 0.01< 0.001< 0.001 |
| Multicultural family, yes | 0.869 | 0.718 | 1.052 | 0.150 |  |  |  |  |  |
| Type of residence  Living with parents Living in a relative's houseLodging or living aloneLiving in a dormitoryLiving in a childcare facility | 11.9201.5941.1481.200 | 1.4571.2011.0340.823 | 2.5302.1151.2751.748 | < 0.001< 0.01< 0.050.343 |  | 11.3431.1911.1450.800 | 0.9870.8771.0200.515 | 1.8261.6191.2851.242 | 0.0600.263< 0.050.320 |
| Perceived household economic statusUpperUpper middleMiddle Lower middle Lower | 11.1141.0931.7782.516 | 1.0321.0171.6282.173 | 1.2021.1741.9422.912 | < 0.001< 0.05< 0.001< 0.001 |  | 11.0150.9021.2501.509 | 0.9330.8321.1311.281 | 1.1040.9781.3811.779 | 0.731< 0.05< 0.001< 0.001 |
| Perceived health statusVery healthy HealthySo soUnhealthyVery unhealthy | 11.4292.3263.8976.393 | 1.3522.1893.5774.740 | 1.5112.4734.2478.623 | < 0.001< 0.001< 0.001< 0.001 |  | 11.3772.1153.4066.198 | 1.2971.9753.0954.474 | 1.4632.2643.7488.585 | < 0.001< 0.001< 0.001< 0.001 |
| Dietary behavior**a**none1 day2 days3 days4 days5 days6 days7 days | 11.1451.0201.0070.9830.9040.8200.671 | 1.0490.9390.9250.8980.8370.7510.632 | 1.2481.1071.0951.0760.9770.8940.712 | < 0.010.6450.8800.711< 0.05< 0.001< 0.001 |  | 11.0860.9920.9700.9750.9480.8950.793 | 0.9890.9080.8860.8840.8720.8150.742 | 1.1931.0851.0631.0751.0310.9830.847 | 0.0860.8660.5140.6080.213< 0.05< 0.001 |
| Body perceptionNormal Very skinny SkinnyObeseVery obese | 11.1141.0161.1901.352 | 1.0030.9601.1321.241 | 1.2391.0761.2511.472 | < 0.050.578 < 0.001< 0.001 |  | 11.1661.1331.0220.934 | 1.0331.0620.9670.849 | 1.3161.2091.0801.029 | < 0.05< 0.0010.4340.168 |
| Effort to control weight None  Weight loss Weight gain Weight maintenance | 11.5461.1541.149 | 1.4761.0621.074 | 1.6191.2541.229 | < 0.001< 0.01< 0.001 |  | 11.2981.2231.151 | 1.2301.1111.070 | 1.3711.3451.239 | < 0.001< 0.001< 0.001 |
| Physical activity**b**None 1 day2 days3 days4 days5 days6 days7 days | 11.1361.0071.0140.9430.9510.9851.054 | 1.0670.9450.9480.8640.8690.8560.965 | 1.2091.0731.0851.0301.0401.1341.151 | < 0.0010.8360.6820.1930.2710.8370.244 |  | 11.2121.1811.2971.2921.3281.4461.625 | 1.1331.1021.2031.1731.2011.2411.469 | 1.2971.2651.3981.4251.4671.6851.797 | < 0.001< 0.001< 0.001< 0.001< 0.001< 0.001< 0.001 |
| Time for studying (WD**c**) 360–479 min< 240 min 240–359 min 480–599 min600–719 min> 720 min | 10.9901.0791.0221.0771.178 | 0.9200.9860.9490.9991.095 | 1.0651.1821.1011.1611.268 | 0.7770.1000.5650.052< 0.001 |  | 11.1491.1941.0151.0621.125 | 1.0621.0830.9370.9781.033 | 1.2431.3161.0991.1541.226 | < 0.01< 0.0010.7150.153< 0.01 |
| Time for studying (WK**d**)None 1–119 min120–239 min240–359 min360–479 min > 480 min | 10.8760.9280.9910.9851.121 | 0.8120.8640.9190.9011.039 | 0.9440.9961.0701.0771.210 | < 0.001< 0.050.8240.744< 0.01 |  | 11.0141.1021.2171.2671.518 | 0.9341.0181.1161.1441.380 | 1.1001.1931.3271.4041.670 | 0.743< 0.05< 0.001< 0.001< 0.001 |
| Time for internet use (WD**c**)None 1–60 min61–120 min 121–180 min > 180 min | 10.8850.9541.0571.344 | 0.8340.8970.9871.259 | 0.9401.0141.1321.434 | < 0.0010.1340.115< 0.001 |  | 11.0251.0571.0421.174 | 0.9490.9740.9501.068 | 1.1071.1471.1441.292 | 0.5310.1840.381< 0.05 |
| Time for internet use (WK**d**)None 1–60 min61–120 min 121–180 min > 180 min | 10.7990.8180.8171.000 | 0.7390.7610.7620.947 | 0.8650.8790.8771.057 | < 0.001< 0.001< 0.0010.993 |  | 10.8660.8950.8940.929 | 0.7880.8190.8170.854 | 0.9520.9790.9791.010 | < 0.01< 0.05< 0.05< 0.01 |
| Alcohol use+, yes | 1.889 | 1.811 | 1.970 | < 0.001 |  | 1.683 | 1.600 | 1.770 | < 0.001 |
| Smoking+, yes | 1.911 | 1.803 | 2.025 | < 0.001 |  | 1.516 | 1.411 | 1.629 | < 0.001 |
| Substance use+, yes | 2.794 | 2.245 | 3.477 | < 0.001 |  | 1.738 | 1.353 | 2.232 | < 0.001 |
| Sexual behavior, yes | 1.996 | 1.831 | 2.176 | < 0.001 |  | 1.504 | 1.360 | 1.663 | < 0.001 |
| Violencee, yes  | 2.459 | 2.142 | 2.823 | < 0.001 |  | 2.149 | 1.839 | 2.510 | < 0.001 |

\*Adjusted Model for all variables shown in Supplement 2, except multicultural family and city type. Dietary behaviors**a**: Number of days of having breakfast of the week, Physical activityb, days: Number of days of physical activity for at least 60 minutes per day of the week, WDc: weekday, WKd: weekend, Violencee: Experience of being treated by doctor due to violence, +: lifetime experience