Additional file 1

Table 1A: Variable selection in Helsinki Birth Cohort Study1934-1944 (✓ included, ✗ excluded).

|  |
| --- |
| Explanatory variables at early life n=2001 |
|  | Descriptives | Association with BMI at 62 years |  |
| Variables | N (%) | Estimate (Beta, 95% CI) | p-value | Inclusion |
| Father'shighestachieved SES |  |  |  | **✓** |
| Professionals | 342 (17) | Ref. |  |  |
| Junior clericals | 453 (23) | 0.66 (0.003, 1.32) | 0.049 |  |
| Workers | 1192 (60) | 1.07 (0.51, 1.63) | 0.000 |  |
| Mother'smarital status |  |  |  | **✗** |
| Married | 1938 (97) | Ref. |  |  |
| Unmarried | 55 (3) | -1.03 (-2.29, 0.22) | 0.107 |  |
| Other | 8 (0.4) | -0.7 (-3.95, 2.56) | 0.674 |  |
| Mother'shighestachieved SES |  |  |  | **✓** |
| Professionals | 81 (4) | Ref. |  |  |
| Junior clerical | 641 (32) | 0.45 (-0.63, 1.53) | 0.417 |  |
| Workers | 1279 (64) | 0.99 (-0.06, 2.04) | 0.066 |  |
| Number of rooms in a household |  |  |  | **✗** |
| 1 room | 623 (43) | Ref. |  |  |
| 2 rooms | 606 (41) | -0.22 (-0.76, 0.32) | 0.432 |  |
| 3 rooms | 182 (12) | -0.47 (-1.26, 0.33) | 0.249 |  |
| 4 rooms | 39 (3) | -1.83 (-3.39, -0.27) | 0.022 |  |
| 5 rooms | 9 (1) | 0.96 (2.21, 4.14) | 0.552 |  |
| 6 rooms | 1 (0.1) | -2.86 (-12.32, 6.6) | 0.553 |  |
| 8 rooms | 1 (0.1) | -4.45 (-13.91, 5.01) | 0.357 |  |
| Size of household-dwelling units (number of persons) |  |  |  | **✗** |
| 2 persons | 24 (2) | Ref. |  |  |
| 3 persons | 570 (44) | 0.66 (-1.3, 2.62) | 0.507 |  |
| 4 persons | 415 (32) | 0.83 (-1.15, 2.8) | 0.412 |  |
| 5 persons | 185 (14) | 0.37 (-1.67, 2.41) | 0.721 |  |
| 6 persons | 66 (5) | 1.83 (-0.41, 4.08) | 0.109 |  |
| 7 persons | 19 (1) | 1.25 (-1.65, 4.14) | 0.398 |  |
| 8 persons | 16 (1) | 0.34 (-2.7, 3.37) | 0.829 |  |
| 9 persons | 3 (0.2) | -0.67 (-6.43, 5.09) | 0.820 |  |
| 10 persons | 2 (0.2) | 1.17 (-5.75, 8.1) | 0.740 |  |
| People per room | 1288 | 0.29 (0.06, 0.53) | 0.013 | **✓** |
|  |
| Explanatory variables at 44 years n=2001 |
| Marital status |  |  |  | **✗** |
| Married | 1555 (78) | Ref. |  |  |
| Other | 435 (22) | 0.18 (-0.32, 0.68) | 0.474 |  |
| Highereducation |  |  |  | **✓** |
| University | 387 (31) | Ref. |  |  |
| Vocational | 28 (2) | 0.62 (-1.14, 2.38) | 0.490 |  |
| No highereducation | 843 (67) | 1.17 (0.62, 1.72) | 0.000 |  |
| Householdincome |  |  |  | **✓** |
| Rank 1 (highest) | 508 (26) | Ref. |  |  |
| Rank 2 | 461 (23) | 0.55 (-0.04, 1.14) | 0.067 |  |
| Rank 3 | 399 (20) | 1.1 (0.48, 1.71) | 0.000 |  |
| Rank 4 | 357 (18) | 0.83 (0.19, 1.46) | 0.011 |  |
| Rank 5 (lowest) | 259 (13) | 0.95 (0.25, 1.65) | 0.008 |  |
| Highestachieved SES |  |  |  | **✓** |
| Highofficial | 618 (32) | Ref. |  |  |
| Lowofficial | 876 (46) | 0.36 (-0.12, 0.83) | 0.146 |  |
| Self-employed | 115 (6) | 1.33 (0.41, 2.26) | 0.005 |  |
| Labourers | 308 (16) | 1.4 (0.77, 2.04) | 0.000 |  |
| Size of household-dwelling units (number of persons) |  |  |  | **✗** |
| 0 persons | 6 (0.3) | Ref. |  |  |
| 1 person | 149 (7) | -2.83 (-6.65, 0.99) | 0.146 |  |
| 2 persons | 383 (19) | -2.66 (-6.43, 1.12) | 0.168 |  |
| 3 persons | 515 (26) | -3.25 (-7.01, 0.52) | 0.091 |  |
| 4 persons | 678 (34) | -3.37 (-7.13, 0.39) | 0.079 |  |
| 5 persons | 208 (10) | -2.56 (-6.36, 1.24) | 0.187 |  |
| 6 persons | 33 (2) | -3.18 (-7.25, 0.89) | 0.126 |  |
| 7 persons | 8 (0.4) | -1.08 (-6.03, 3.87) | 0.669 |  |
| 8 persons | 6 (0.3) | -1.02 (-6.31, 4.28) | 0.707 |  |
| 9 persons | 4 (0.2) | 1.76 (-4.16, 7.68) | 0.560 |  |
| Number of rooms in a household |  |  |  | **✗** |
| 1 room | 99 (5) | Ref. |  |  |
| 2 rooms | 326 (17) | 0.27 (-0.78, 1.33) | 0.611 |  |
| 3 rooms | 540 (28) | -0.18 (-1.18, 0.83) | 0.732 |  |
| 4 rooms | 572 (29) | -0.27 (-1.27, 0.73) | 0.596 |  |
| 5 rooms | 287 (15) | -0.67 (-1.74, 0.41) | 0.222 |  |
| 6 rooms | 86 (4) | -0.59 (-1.94, 0.77) | 0.398 |  |
| 7 rooms | 26 (1) | -0.5 (-2.53, 1.53) | 0.629 |  |
| 8 rooms | 4 (0.2) | 1.3 (-3.4, 6) | 0.588 |  |
| 9 rooms | 3 (0.2) | 2.94 (-2.45, 8.34) | 0.285 |  |
| People per room | 1943 | 0.48 (-0.002, 0.95) | 0.051 | **✗** |

All regression analyses are unadjusted.

Table 1B: Variable selection in Northern Finland Birth Cohort 1966 (✓ included, ✗ excluded).

|  |
| --- |
| Explanatory variables at early life n=5828 |
| Variables | Descriptives | Association with BMI at 46 years | Inclusion |
|  | N (%) | Estimate (Beta, 95% CI) | p-value |  |
| Parentalmarital status |  |  |  | **✓** |
| Married | 5611 (97) | Ref. |  |  |
| Unmarried/divorced/widow | 188 (3) | 1.01 (0.30, 1.72) | 0.006 |  |
| Maternaloccupation |  |  |  | **✓** |
|  Professional | 773 (14) | Ref. |  |  |
| Skilledworkers | 1265 (22) | 0.38 (-0.05, 0.82) | 0.09 |  |
| Farmer/farmer’swife | 3240 (57) | 0.54 (0.16, 0.92) | 0.006 |  |
| Unskilledworkers | 445 (8) | 0.91 (0.34,1.48) | 0.002 |  |
| Paternaloccupation |  |  |  | **✓** |
|  Professional | 1455 (26) | Ref. |  |  |
| Skilledworkers | 1846 (33) | 0.44 (0.11, 0.78) | 0.01 |  |
| Farmer | 1174 (21) | 0.31 (-0.06, 0.69) | 0.10 |  |
| Unskilledworkers | 1077 (19) | 0.68 (0.30, 1.07) | 0.001 |  |
|  No occupation | 36 (1) | 0.64 (-0.97,2.26) | 0.43 |  |
| Materialwealth |  |  |  | **✓** |
|  Rank 0 (highest) | 215 (4) | Ref. |  |  |
|  Rank 1 | 632 (12) | 0.07 (-0.69, 0.83) | 0.85 |  |
|  Rank 2 | 1065 (21) | 0.28 (-0.44, 0.99) | 0.45 |  |
|  Rank 3 | 1275 (25) | 0.56 (-0.15, 1.27) | 0.12 |  |
|  Rank 4 | 1145 (22) | 0.71 (-0.01, 1.42) | 0.05 |  |
|  Rank 5 | 701 (14) | 0.80 (0.05, 1.55) | 0.04 |  |
|  Rank 6 (lowest) | 149 (3) | 1.24 (0.22, 2.27) | 0.02 |  |
| Maternaleducation |  |  |  | **✓** |
| Matriculation+ | 296 (5) | Ref. |  |  |
| Vocational | 1758 (31) | 0.30 (-0.30, 0.90) | 0.33 |  |
| Primaryonly | 3667 (64) | 0.83 (0.25, 1.41) | 0.01 |  |
|  |  |  |  |  |
| Explanatory variables at 46 years n=5828 |
| Marital status |  |  |  | **✗** |
| Married/civil part/cohabiting  | 4354 (79) | Ref. |  |  |
|  Single/divorced/widow | 1171 (21) | 0.20 (-0.11, 0.52) | 0.20 |  |
| Basic education |  |  |  | **✓** |
| Matriculation | 2522 (46) | Ref. |  |  |
|  No matriculation | 2989 (54) | 1.20 (0.94, 1.45) | <0.001 |  |
| Highereducation |  |  |  | **✓** |
| University | 1533 (29) | Ref. |  |  |
| Vocational | 3655 (68) | 1.10 (0.82, 1.40) | <0.001 |  |
|  No highereducation | 183 (3) | 2.27 (1.53, 3.01) | <0.001 |  |
| Occupation |  |  |  | **✓** |
|  Professional | 3799 (67) | Ref. |  |  |
| Manualworker/farmer | 1112 (20) | 0.94 (0.61, 1.26) | <0.001 |  |
| Notcurrentlyworking | 768 (14) | 1.01 (0.63, 1.38) | <0.001 |  |
| Employmenthistory |  |  |  | **✗** |
| Mostlyemployed | 5300 (97) | Ref. |  |  |
| Mostlyunemployed | 181 (3) | 0.33 (-0.39, 1.05) | 0.37 |  |
| Employment status |  |  |  | **✓** |
| Employed | 4840 (88) | Ref. |  |  |
| Not in labour force | 389 (7) | 1.11 (0.61, 1.61) | <0.001 |  |
| Unemployed | 267 (5) | 0.51 (-0.09, 1.11) | 0.10 |  |
| Home ownership |  |  |  | **✓** |
|  Home ownership | 4660 (85) | Ref. |  |  |
|  No home ownership | 847 (15) | 0.82 (0.47, 1.18) | <0.001 |  |
| Householdincome |  |  |  | **✗** |
|  Rank 1 (highest) | 584 (20) | Ref. |  |  |
|  Rank 2 | 571 (20) | 0.33 (-0.19, 0.86) | 0.22 |  |
|  Rank 3 | 595 (21) | 0.69 (0.17, 1.21) | 0.01 |  |
|  Rank 4 | 558 (19) | -0.06 (-0.59, 0.47) | 0.82 |  |
|  Rank 5 (lowest) | 575 (20) | -0.28 (-0.80, 0.25) | 0.30 |  |

All regression analyses are unadjusted.

Table 1C: Variable selection in Northern Finland Birth Cohort 1986 (✓ included, ✗ excluded).

|  |
| --- |
| Explanatory variables at early life n = 6764 |
| Variables | Descriptives | Association with BMI at 16 years | Inclusion |
|  | N (%) | Estimate (Beta, 95% CI) | p-value |  |
| Parentalmarital status |  |  |  | **✗** |
| Married/co-habiting | 6444 (95) | Ref. |  |  |
|  Single/divorced/widow | 306 (5) | 0.31 (-0.10, 0.71) | 0.13 |  |
| Maternaloccupation |  |  |  | **✓** |
|  Professional | 1835 (28) | Ref. |  |  |
| Skilledworkers | 2639 (40) | 0.29 (0.08, 0.49) | 0.007 |  |
| Farmer/farmer’swife | 334 (5) | 1.27 (0.86,1.68) | <0.001 |  |
| Unskilledworkers | 1757 (27) | 0.19 (-0.04,0.42) | 0.11 |  |
| Paternaloccupation |  |  |  | **✓** |
|  Professional | 2219 (35) | Ref. |  |  |
| Skilledworkers | 3069 (48) | 0.31 (0.12, 0.50) | 0.001 |  |
| Farmer | 453 (7) | 0.69 (0.34, 1.04) | 0.001 |  |
| Unskilledworkers | 664 (10) | 0.16 (-0.14,0.46) | 0.31 |  |
| Materialwealth |  |  |  | **✓** |
|  Rank 0 (highest) | 437 (7) | Ref. |  |  |
|  Rank 1 | 2256 (37) | 0.02 (-0.34, 0.38) | 0.93 |  |
|  Rank 2 | 1652 (27) | -0.13(-0.50, 0.24) | 0.50 |  |
|  Rank 3 | 913 (15) | -0.04 (-0.44,0.36) | 0.85 |  |
|  Rank 4 | 469 (8) | 0.24 (-0.22,0.70) | 0.30 |  |
|  Rank 5 | 172 (3) | 0.13 (-0.49, 0.75) | 0.67 |  |
|  Rank 6 | 83 (1) | 0.48(-0.34, 1.31) | 0.25 |  |
|  Rank 7 | 85 (1) | 0.94 (0.12,1.75) | 0.02 |  |
|  Rank 8 (lowest) | 52 (1) | 0.09 (-0.91,1.10) | 0.85 |  |
| Maternaleducation |  |  |  | **✓** |
| Matriculation + | 1814 (31) | Ref. |  |  |
| Vocational | 2688 (45) | 0.37 (0.16,0.58) | 0.005 |  |
| Primaryonly | 1439 (24) | 0.48 (0.24,0.73) | 0.001 |  |

All regression analyses are unadjusted.

Table 2. Social disadvantage variables with their original categorizations and coding used within confirmatory factor analysis in early life in Helsinki Birth Cohort Study1934-1944 (HBCS 1934-1944), Northern Finland Birth Cohort 1966 (NFBC1966), and Northern Finland Birth Cohort Study 1986 (NFBC1986) and at age of 44-years in HBCS1934-1944 and 46-years in NFBC1966.

|  |  |  |  |
| --- | --- | --- | --- |
| HBCS |  | NFBC 1966 | NFBC 1986 |
| Original categorizations | Categorizations used | Original categorizations |  Categorizations used  | Original categorizations |  Categorizations used  |
| Early life | Early life | Early life |
| - | - | Parental marital status1. married
2. unmarried
3. widowed
4. divorced
 | 1. married 2. unmarried, divorced, widowed | - | - |
| - | - | Maternal education1.none or circulating school2.1-4 years of elementary school3. 5-8 years of elementary school or part of the secondary school4. ½ -2 years of vocational school5. more than 2 years of vocational school6. secondary school7 secondary school and more8. matriculation examination9. matriculation examination and more | 1. matriculation examination or more2. vocational school or secondary school and more (at least ½ year of vocational school)3. primary only (none or 1-8 years of elementary school or part of the secondary school) | Maternal education1. <6 of primary school2. 7-8 years primary school3. 9-10 years primary school4. vocational school or college 6-12 months5. vocational school > 1year or college6. matriculation, no vocational schooling7. matriculation +college8. matriculation, university studies not finished9. university degree | 1. matriculation+2. vocational 3. primary only  |
| Maternal occupation1. Housewives
2. Employers
3. Self-employed
4. Senior clericals
5. Junior clericals
6. Workers
7. Pensioners
8. Students

8. Others | 1. Professionals/Senior clericals – Employers, Self-employed, Senior clericals2. Junior clericals3. Workers | Nine response categories were conducted based on the question concerning maternal occupation:1. no occupation (housewife)
2. upper white collar
3. lower white collar
4. skilled worker
5. unskilled worker
6. farmer, field area ≥8 ha
7. farmer, field area <8 ha
8. farmers’s wife, field area ≥8ha
9. farmers’ wife, field area <8 ha
 | 1. professional – upper and lower white-collar2. skilled worker3. farmer/farmer’s wife/housewife4. unskilled worker | Ten response categories concerning maternal occupation: 1. unskilled or apprentice2. skilled manual3.skilled non-manual4. professional5. entrepreneur6. farmer7. student8.at home9. sick pension10. unemployed  | 1.professional2.skilled workers3.farmer/farmer’s wife4.unskilled workers |
| Paternal occupation based on the birth, child welfare and school records. A combined score from these was made.  | 1. professional
2. junior clericals

workers | Seven response categories were conducted based on the question concerning paternal occupation:1. no occupation
2. upper white collar
3. lower white collar
4. skilled worker
5. unskilled worker
6. farmer, field area ≥8 ha
7. farmer, field area <8 ha
 | 1. professional – upper and lower white-collar2. skilled worker3. farmer4. unskilled worker5. no occupation | Ten response categories concerning paternal occupation: 1. unskilled or apprentice2. skilled manual3.skilled non-manual4. professional5. entrepreneur6. farmer7. student8.at home9. sick pension10. unemployed  | 1.professional2.skilled workers3.farmers4.unskilled workers |
|  |  | Does the family have:1.an apartment or house of their own2.a carDoes the family’s dwelling have:1. electricity2. telephone3. running water4. televisionResponse options were yes or no |  | Does the family possess:1.an owner-occupied dwelling2.a summer cottage3. a car4.an automatic washing machine5. a telephone6.a central heating7. a flushing toilet8 a separate bath room |  |
| Number of people per room - continuous | Number of people per room |  |  |  |  |
| At the age of 41-51 years in HBCS | At the age of 46-years in NFBC1966 |  |
| Higher education based on the register | Higher education1.university2. vocational3 no higher education | Basic education:1. less than 9 years of basic school
2. basic school
3. matriculation examination

Further education:1. no occupational education
2. vocational training course
3. vocational school
4. post-secondary education
5. polytechnic education
6. university degree
7. some other education, what?
8. education is unfinished
 | Basic:1. matriculation examination2. no matriculation (basic school orless)Higher:1. university degree – and unfinished education, polytechnic education2. vocational training - post-secondary education, vocational training course or vocational school3. no higher education | - | - |
| Occupation based on the register (highest achieves SES) | Occupation1. High officials
2. Low Officials
3. Self-employed

Labourers | Nine response categories were conducted based on the national register concerning occupation.1. farmer entrepreneurs
2. entrepreneurs
3. upper white-collar
4. lower white collar
5. workers
6. students
7. pensioners
8. unemployed
9. others
 | 1. professional – entrepreneurs,upper and lower white collar2. manual worker/farmer3. not currently working | - | - |
|  |  | Participants were asked to select an option to best describe their present employment situation (if along with mainwork you are doing other job or you are studying mark both): 1. permanentfull-timejob
2. permanent part-time job
3. fixed-term full-time job
4. fixed-term part-time job
5. entrepreneur full-time
6. entrepreneur part-time
7. student full-time
8. student part-time
9. unemployed less than ½ years
10. unemployed ½-1 year
11. unemployed over 1 year
12. education or work with labor policy support
13. laid off temporarily or reduced working hours
14. maternity/paternal leave, child care leave
15. retired
16. take care of own household
17. do else, what?
 | 1. employed – permanent, fixed-term, part-time, entrepreneur2. not in labour market – retired, student, parental leave, education or work with labor policy support3. unemployed – orother. | - | - |
| Household income based on the register- continuous | quintiles | - | - | - | - |
|  |  | Do you live:1. in an owner-occupied flat
2. in a rentalflat
3. in a partially owned flat
4. in a company-owned dwelling
5. in a student dorm
6. supported housing
 | 1. home ownership (in an owner-occupied flat) 2. no home ownership (in a rental flat, partially owned, company-owned, student dorm, supported housing) | - | - |

Text1. Genotype quality controlfor NFBC1966 and more detailed information concerning calculation of polygenic risk score for body mass index (BMI).

NFBC1966 genotype quality control

Genotyping of the NFBC1966 participants was carried out at the Broad Institute using the Illumina Infinium 370cnvDuo array and the Beadstudio calling algorithm, as described previously by Sabatti*et al.*([1](#_ENREF_1))*.* Individuals were excluded due to call rate < 95%, unspecified sex, sample duplication/contamination, sex mismatch, relatedness (identity by descent [IBD]), outlying heterozygosity or withdrawal of consent, giving a sample size of 5400. Population stratification was assessed by multidimensional scaling analysis (MDS) and compared with Hapmap phase 3 reference populations; no individuals of non-European ancestry were detected. Copy number variations (CNVs) and single nucleotide polymorphisms (SNPs) with call rate < 95% (for markers with minor allele frequency [MAF] > 5%), CNVs and SNPs with call rate < 99% (for markers with MAF <5%), lack of Hardy-Weinberg equilibrium (HWE) (*P*< 1.0 x 10-4) or MAF < 1% were excluded. Array genotypes were harmonised and imputed to the Haplotype Reference Consortium (HRC) imputation reference panel ([2](#_ENREF_2)) via the Michigan imputation server ([3](#_ENREF_3)). We excluded imputed SNPs due to minor allele count (MAC) < 5, imputation quality score (*r*2) < 0.3 or evidence for Hardy-Weinberg disequilibrium (*P*< 1e-6); we included only autosomal SNPs and used hard called genotypes (as output by the minimac3 software package ([3](#_ENREF_3))) in subsequent analyses.

For calculating for polygenic risk score for BMI BOLT-LMM-model was used.The BOLT-LMM model is similar to the best linear unbiased predictor (BLUP) model, in which SNPs are fitted as random effects in order to account for linkage disequilibrium (correlation between SNPs). Whereas the BLUP model assumes that SNP effects are normally distributed, BOLT-LMM specifies a mixture of Gaussians prior on SNP effects, which accounts for larger-effect SNPs and may yield a PRS which explains a greater proportion of phenotypic variance (4). We estimated BOLT-LMM SNP effects in the UK Biobank (UKB), a prospective cohort of 502,628 volunteers recruited across the UK at age 40–69 years through United Kingdom National Health Service registers (5,6).Participants attended dedicated assessment centres across the UK between 2006 and 2010, during which weight and height were measured by trained study personnel.  We included 457,822 individuals with genotype and BMI data available and self-reported white ethnicity (UKB field ID f.21000.0.0), and fitted the model using 672,345 genotyped autosomal SNPs with MAF > 0.01% and missingness < 10%. We treated the BMI phenotype (f.21001.0.0) similarly to recent genome-wide association studies (4,7): we calculated residuals for BMI regressed on age (f.21003.0.0), age squared, study centre (f.54.0.0) and genotype batch (f.22000.0.0) for men and women separately, which we subsequently normalised using an inverse-normal transformation. We included 20 ancestry informative principal components (PCs) as fixed effects when fitting the BOLT-LMM Bayesian BLUP model, calculated using the “--pca approx” command in plink 2.0 (8) with the same set of SNPs used for fitting the model as described above.

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Table 3. Association of early social disadvantage with visceral fat area (cm2),waist circumference (cm) and body fat (%)at 46-years in Northern Finland Birth Cohort 1966 (NFBC1966).

|  |  |  |
| --- | --- | --- |
|  | Early social disadvantage |  |
|  | High  | Intermediate  | Low  |  |
|  | n (%) | n (%) | n (%) |  |
|  | 1463 (25%) | 2900 (50%) | 1444 (25%) |  |
|  | n mean (sd) | n mean (sd) | n mean (sd) | p-value |
| Visceral fat area  | 1441 109.58 (43.04) | 2853105.06 (41.10) | 1412 100.78 (40.52) | <0.001 |
| Waist  |  |  |  |  |
|  Men | 61597.90 (11.97) | 1244 97.61 (11.69) | 675 97.25 (12.09) | 0.613 |
|  Women | 840 88.39 (13.74) | 1635 87.25 (13.04) | 758 85.69 (12.30) | 0.0002 |
| Body fat |  |  |  |  |
|  Men | 61023.84 (7.48) | 1229 23.27 (6.95) | 664 23.13 (7.25) | 0.164 |
|  Women | 83134.20 (8.42) | 1624 33.16 (8.42) | 748 32.12 (8.17) | <0.001 |

Table4. Association between early social disadvantage with visceral fat area (cm2) at age of 46-years in Northern Finland Birth Cohort 1966 (NFBC1966, n=3294). Low social disadvantage was set as a reference group.

|  |  |
| --- | --- |
|  | Visceral fat area |
| Early social disadvantage | Estimate (Beta, 95% CI) | p-value | R2 |
| Model 1 |  |  |  |
| Low  | Ref. |  |  |
|  Intermediate  | 6.02 (2.55, 9.48) | <0.001 |  |
|  High  | 9.47 (5.39, 13.54) | <0.001 | 0.007 |
| Model 2 |  |  |  |
|  Low | Ref. |  |  |
| Intermediate  | 5.42 (2.09, 8.74) | 0.0014 |  |
|  High  | 8.47 (4.49, 12.46) | <0.001 | 0.10 |
| Model 3 |  |  |  |
|  Low | Ref. |  |  |
| Intermediate  | 4.83 (1.52, 8.13) | 0.004 |  |
|  High  | 7.31 (3.33, 11.29) | <0.001 | 0.11 |
| Model4 |  |  |  |
|  Low  | Ref. |  |  |
| Intermediate  | 4.43 (1.15, 7.71) | 0.008 |  |
|  High  | 6.54 (2.58, 10.49) | <0.001 | 0.13 |

Model 1 unadjusted.

Model 2 adjusted for PRS BMI and population stratification (PS).

Model 3 adjusted for PRS BMI, PS and maternal BMI.

Model 4 adjusted for PRS BMI, PS, maternal BMI and sex.

Table5. Associations between early social disadvantage with waist circumference (cm) and body fat (%) at age of 46-years in men and in women in Northern Finland Birth Cohort 1966 (NFBC1966).Low social disadvantage was set as a reference group.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Men |  |  | Women |  |  |
|  | Waist circumference |
| Early social adversity | Estimate (Beta, 95% CI) | p-value | R2 | Estimate (Beta, 95% CI) | p-value | R2 |
| Model 1 |  n=1448 |  |  | n=1883 |  |  |
| Low | Ref. |  |  | Ref. |  |  |
|  Intermediate  | 0.92 (-0.46, 2.31) | 0.190 |  | 1.85 (0.35, 3.57) | 0.016 |  |
|  High  | 0.97 (-0.72, 2.65) | 0.261 | 0.001 | 2.90 (1.17, 4.62) | 0.001 | 0.006 |
| Model 2 |  |  |  |  |  |  |
| Low | Ref. |  |  | Ref. |  |  |
| Intermediate  | 0.65 (-0.69, 1.98) | 0.342 |  | 2.01 (0.57, 3.45) | 0.006 |  |
|  High  | 0.91 (-0.75, 2.57) | 0.282 | 0.080 | 2.86 (1.17, 4.56) | <0.001 | 0.107 |
| Model 3 |  |  |  |  |  |  |
| Low | Ref. |  |  | Ref. |  |  |
| Intermediate  | 0.45 (-0.89, 1.78) | 0.512 |  | 1.88 (0.44, 3.31) | 0.010 |  |
|  High  | 0.64 (-1.02, 2.29) | 0.449 | 0.091 | 2.49 (0.80, 4.19) | 0.004 | 0.115 |
|  |  |  |  |  |  |  |
|  | Body fat |
|  | n=1430 |  |  | n=1864 |  |  |
| Model 1 |  |  |  |  |  |  |
|  Low | Ref. |  |  | Ref. |  |  |
|  Intermediate  | 0.45 (-0.42, 1.31) | 0.309 |  | 1.21 (0.25, 2.18) | 0.01 |  |
|  High  | 0.68 (-0.37, 1.73) | 0.207 | 0.001 | 2.07 (0.96, 3.18) | <0.001 | 0.007 |
| Model 2 |  |  |  |  |  |  |
|  Low | Ref. |  |  | Ref. |  |  |
|  Intermediate  | 0.26 (-0.59, 1.10) | 0.548 |  | 1.31 (0.38, 2.24) | 0.005 |  |
| High  | 0.51 (-0.54, 1.56) | 0.340 | 0.060 | 1.99 (0.91, 3.09) | <0.001 | 0.105 |
| Model 3 |  |  |  |  |  |  |
|  Low | Ref. |  |  | Ref. |  |  |
| Intermediate  | 0.16 (-0.69, 1.00) | 0.715 |  | 1.24 (0.31, 2.16) | 0.009 |  |
|  High  | 0.37 (-0.68, 1.41) | 0.489 | 0.067 | 1.81 (0.72, 2.90) | <0.001 | 0.110 |

Model 1 unadjusted.

Model 2 adjusted for PRS BMI and population stratification (PS).

Model 3 adjusted for PRS BMI, PS and maternal BMI.

Table 6. Association of change in social disadvantage during the life-course with visceral fat area (cm2) at age of 46-years in Northern Finland Birth Cohort (NFBC1966, n=3293). Increased social disadvantage was set as a reference group.

|  |  |
| --- | --- |
|  | Visceral fat area |
| Change in social adversity | Estimate (Beta, 95% CI) | p-value | R2 |
| Model 1 |  |  |  |
|  Increase | Ref. |  |  |
|  Stable | 0.70 (-2.60, 4.00) | 0.676 |  |
|  Reduced  | -2.63 (-6.50, 1.24) | 0.182 | <0.001 |
| Model 2 |  |  |  |
|  Increase | Ref. |  |  |
| Stable | 1.04 (-2.11, 4.18) | 0.518 |  |
|  Reduced  | -2.43 (-6.14, 1.27) | 0.198 | 0.099 |
| Model 3 |  |  |  |
|  Increase | Ref. |  |  |
| Stable | 1.19 (-1.94, 4.31) | 0.456 |  |
|  Reduced  | -2.50 (-6.18, 1.18) | 0.183 | 0.111 |
| Model 4 |  |  |  |
| Increase | Ref. |  |  |
|  Stable | -0.10 (-3.21, 3.01) | 0.950 |  |
|  Reduced | -5.02 (-8.72, -1.32) | 0.008 | 0.127 |

Model 1 unadjusted.

Model 2 adjusted for PRS BMI and population stratification (PS).

Model 3 adjusted for PRS BMI, PS and maternal BMI.

Model 4 adjusted for PRS BMI, PS, maternal BMI and sex.

Table 7. Association of change in social disadvantage during the lifecourse with waist circumference (cm) and body fat (%) at age of 46-years in men and women in Northern Finland Birth Cohort 1966 (NFBC1966). Increased social disadvantage was set as a reference group.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Men |  |  | Women |  |  |
|  | Waist circumference |  |  |
| Change in social adversity | Estimate (Beta, 95% CI) | p-value | R2 | Estimate (Beta, 95% CI) | p-value | R2 |
|  | n=1447 |  |  | n=1883 |  |  |
| Model 1 |  |  |  |  |  |  |
|  Increase | Ref. |  |  | Ref. |  |  |
|  Stable | 0.77 (-0.51, 2.05) | 0.239 |  | -1.58 (-3.05, -0.11) | 0.035 |  |
|  Reduced  | -0.80 (-2.50, 0.91) | 0.359 | 0.002 | -2.87 (-4.50, -1.24) | <0.001 | 0.006 |
| Model 2 |  |  |  |  |  |  |
|  Increase | Ref. |  |  | Ref. |  |  |
|  Stable | 0.84 (-0.39, 2.08) | 0.180 |  | -1.22 (-2.62, 0.19) | 0.089 |  |
|  Reduced  | -0.78 (-2.42, 0.87) | 0.355 | 0.083 | -2.51 (-4.07, -0.94) | 0.002 | 0.106 |
| Model 3 |  |  |  |  |  |  |
| Increase |  |  |  |  |  |  |
| Stable | 0.85 (-0.38, 2.07) | 0.177 |  | -1.16 (-2.55, 0.24) | 0.104 |  |
|  Reduced  | -0.75 (-2.38, 0.89) | 0.371 | 0.093 | -2.55 (-4.11, -0.99) | 0.001 | 0.116 |
|  | Body fat |  |  |
|  |  |  |  |  |  |  |
|  | n=1429 |  |  | n=1864 |  |  |
| Model 1 |  |  |  |  |  |  |
|  Increase | Ref. |  |  | Ref. |  |  |
|  Stable | 0.62 (-0.18, 1.42) | 0.127 |  | -0.80 (-1.75, 0.15) | 0.098 |  |
|  Reduced  | 0.24 (-0.82, 1.30) | 0.652 | 0.002 | -1.43 (-2.47, -0.38) | 0.007 | 0.004 |
| Model 2 |  |  |  |  |  |  |
|  Increase | Ref. |  |  | Ref. |  |  |
|  Stable | 0.62 (-0.16, 1.40) | 0.117 |  | -0.62 (-1.52, 0.29) | 0.183 |  |
|  Reduced  | 0.22 (-0.82, 1.25) | 0.683 | 0.062 | -1.27 (-2.27, -0.26) | 0.014 | 0.101 |
| Model 3 |  |  |  |  |  |  |
|  Increase | Ref. |  |  | Ref.  |  |  |
| Stable | 0.63 (-0.15, 1.40) | 0.114 |  | -0.58 (-1.48, 0.32) | 0.206 |  |
|  Reduced  | 0.23 (-0.80, 1.26) | 0.659 | 0.069 | -1.29 (-2.29, -0.29) | 0.011 | 0.108 |

Model 1 unadjusted.

Model 2 adjusted for PRS BMI and population stratification (PS).

Model 3 adjusted for PRS BMI, PS and maternal BMI.

Figure 1. Directed acyclic diagram (DAG) for the tested association. We may hypothesise the association between exposure to early social disadvantage to be the result of co-existing pathways. This includes the possible interplay with the child polygenic risk score for BMI that might in part proxy some confounding effects of his/her parents’ BMI.

