

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Sleep	rs1191685	C	0.37	2.870	0.470	0.030	0.042	0.477
Sleep	rs1823125	G	0.26	3.010	0.500	-0.019	0.047	0.685
Sleep	rs1807282	T	0.26	2.890	0.490	0.020	0.047	0.675
Sleep	rs4587207	G	0.80	3.140	0.560	-0.049	0.052	0.352
Sleep	rs4248149	C	0.80	3.080	0.560	-0.058	0.058	0.317
Sleep	rs2394403	T	0.80	3.070	0.560	0.049	0.056	0.379
Morning person	rs12736689	T	0.03	0.131	0.015	-0.029	0.118	0.803
Morning person	rs9479402	T	0.01	0.161	0.024	0.010	0.265	0.970
Morning person	rs55694368	T	0.93	0.066	0.012	0.122	0.063	0.052
Morning person	rs35833281	G	0.21	0.036	0.006	0.049	0.044	0.269
Morning person	rs11545787	A	0.76	0.033	0.006	0.020	0.049	0.684
Morning person	rs11121022	A	0.42	0.029	0.005	0.058	0.038	0.122
Morning person	rs9565309	C	0.97	0.076	0.013	0.300	0.111	0.007
Morning person	rs1595824	C	0.50	0.033	0.005	0.049	0.040	0.228
Morning person	rs34714364	G	0.17	0.049	0.008	-0.036	0.055	0.518
Morning person	rs12965577	G	0.66	0.027	0.005	0.039	0.047	0.400
Morning person	rs12927162	G	0.74	0.041	0.006	0.020	0.053	0.707
Morning person	rs10493596	C	0.24	0.037	0.005	-0.071	0.048	0.134
Morning person	rs2948276	G	0.82	0.036	0.007	0.086	0.056	0.126
Morning person	rs6582618	A	0.52	0.029	0.005	-0.013	0.040	0.742
smoking (number)	rs1051730	A	0.35	1.021	0.056	0.077	0.041	0.058
smoking (number)	rs16969968	A	0.35	1.003	0.056	0.086	0.043	0.046
smoking (number)	rs1329650	G	0.72	0.367	0.059	0.025	0.045	0.577
smoking (number)	rs1028936	A	0.82	0.446	0.074	-0.035	0.053	0.515
Smoking initiation	rs6265	C	0.79	0.061	0.011	-0.018	0.051	0.723
Smoking initiation	rs1013442	A	0.74	0.055	0.010	-0.019	0.047	0.685
Smoking initiation	rs4923457	A	0.77	0.059	0.011	-0.017	0.050	0.730
Smoking initiation	rs4923460	G	0.77	0.058	0.011	-0.017	0.049	0.729
Smoking initiation	rs4074134	C	0.77	0.058	0.011	-0.011	0.052	0.832
Smoking initiation	rs1304100	A	0.74	0.055	0.010	-0.023	0.048	0.628
Smoking initiation	rs6484320	A	0.76	0.057	0.010	-0.027	0.050	0.581
Smoking initiation	rs879048	A	0.77	0.058	0.011	-0.012	0.049	0.804
Smoking cessation	rs3025343	G	0.84	0.121	0.022	-0.121	0.063	0.053
Vitamin B <sub>6</sub>	rs1256335	A	0.21	0.140	0.020	-0.007	0.046	0.879
Vitamin B <sub>6</sub>	rs4654748	T	0.52	0.102	0.010	0.010	0.037	0.790
folate	rs17421511	G	0.83	0.098	0.023	-0.078	0.055	0.154
folate	rs1801133	G	0.67	0.100	0.026	0.010	0.055	0.855
Vitamin B <sub>12</sub>	rs492602	G	0.56	0.060	0.010	-0.024	0.040	0.545
Vitamin B <sub>12</sub>	rs526934	A	0.27	0.050	0.010	-0.049	0.048	0.305
Vitamin B <sub>12</sub>	rs601338	A	0.55	0.060	0.010	-0.016	0.040	0.685
Vitamin B <sub>12</sub>	rs9473555	G	0.35	0.040	0.010	0.010	0.028	0.720
Vitamin B <sub>12</sub>	rs2270655	G	0.94	0.250	0.013	-0.157	0.091	0.083
Vitamin B <sub>12</sub>	rs2336573	T	0.03	0.320	0.021	-0.223	0.108	0.039
Vitamin B <sub>12</sub>	rs3742801	T	0.29	0.045	0.015	-0.020	0.035	0.568

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B<sub>6</sub> to one SD (assuming one SD = 47.77 pmol/ml), vitamin B<sub>12</sub> to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Vitamin B <sub>12</sub>	rs5753231	C	0.80	0.064	0.011	-0.095	0.050	0.059
Vitamin B <sub>12</sub>	rs1801222	G	0.59	0.110	0.022	-0.049	0.043	0.257
Vitamin B <sub>12</sub>	rs602662	A	0.60	0.160	0.017	-0.009	0.038	0.814
vitamin D	rs3755967	C	0.72	0.082	0.004	-0.067	0.044	0.127
vitamin D	rs2282679	T	0.28	0.085	0.004	0.058	0.042	0.165
vitamin D	rs12785878	T	0.75	0.033	0.004	-0.017	0.049	0.729
vitamin D	rs4944062	T	0.75	0.034	0.004	-0.016	0.048	0.737
vitamin D	rs10741657	A	0.40	0.030	0.004	-0.014	0.040	0.723
vitamin D	rs10745742	T	0.40	0.017	0.002	0.020	0.052	0.704
vitamin D	rs8018720	G	0.82	0.017	0.003	-0.048	0.053	0.364
vitamin C	rs33972313	T	NA	0.080	0.033	0.010	0.083	0.904
vitamin E	rs964184	G	0.15	0.040	0.010	-0.007	0.060	0.907
vitamin E	rs2108622	T	0.21	0.040	0.010	-0.021	0.045	0.634
vitamin E	rs11057839	A	0.15	0.040	0.010	0.131	0.059	0.028
Hcy	rs12134663	C	0.20	0.101	0.011	-0.087	0.055	0.113
Hcy	rs12780845	A	0.65	0.053	0.009	-0.067	0.044	0.123
Hcy	rs154657	A	0.47	0.096	0.007	0.020	0.046	0.669
Hcy	rs1801133	G	0.67	0.158	0.007	0.010	0.055	0.855
Hcy	rs1801222	G	0.59	0.045	0.007	0.049	0.043	0.257
Hcy	rs2251468	C	0.35	0.051	0.007	-0.028	0.042	0.501
Hcy	rs2275565	G	0.79	0.054	0.009	0.010	0.043	0.815
Hcy	rs234709	C	0.55	0.072	0.007	-0.024	0.040	0.547
Hcy	rs2851391	T	0.47	0.056	0.008	-0.006	0.042	0.887
Hcy	rs42648	G	0.60	0.040	0.007	0.010	0.075	0.895
Hcy	rs4660306	T	0.33	0.044	0.007	0.030	0.045	0.512
Hcy	rs548987	C	0.13	0.060	0.010	0.030	0.050	0.552
Hcy	rs7130284	C	0.93	0.124	0.013	-0.029	0.077	0.702
Hcy	rs838133	G	0.55	0.042	0.007	-0.007	0.040	0.861
Hcy	rs9369898	A	0.62	0.045	0.007	-0.054	0.041	0.185
Hcy	rs957140	G	0.55	0.045	0.008	0.030	0.038	0.436
Se	rs248381	G	0.50	0.025	0.003	-0.015	0.041	0.713
Se	rs17823744	G	0.12	0.045	0.005	-0.028	0.061	0.640
Se	rs7700970	T	0.30	0.030	0.004	-0.016	0.045	0.721
Se	rs567754	C	0.67	0.018	0.004	-0.041	0.042	0.332
iron	rs855791	G	0.58	0.187	0.020	-0.089	0.041	0.029
iron	rs1800562	G	0.94	0.329	0.037	0.039	0.068	0.561
ALA	rs174547	C	0.33	0.016	0.001	-0.020	0.040	0.617
DPA	rs780094	T	0.41	0.017	0.003	0.068	0.039	0.081
DPA	rs3734398	C	0.43	0.040	0.003	0.068	0.042	0.110
DPA	rs12662634	G	0.82	0.023	0.005	-0.050	0.051	0.329
DPA	rs174547	C	0.33	0.075	0.003	0.020	0.040	0.617
EPA	rs3798713	C	0.43	0.035	0.005	-0.049	0.037	0.189
EPA	rs174538	G	0.72	0.083	0.005	-0.020	0.046	0.667
EPA	rs174535	T	0.69	0.072	0.004	-0.010	0.033	0.762

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentaenoic acid; DHA = Docosahexaenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

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Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
DHA	rs2236212	G	0.57	0.113	0.014	-0.058	0.039	0.135
20:0	rs2100944	G	0.22	0.027	0.033	0.039	0.047	0.399
20:0	rs11666913	C	0.41	0.038	0.039	0.039	0.045	0.379
20:0	rs680379	A	0.38	0.024	0.022	-0.012	0.043	0.777
22:0	rs2100944	G	0.22	0.030	0.024	0.039	0.047	0.399
22:0	rs11666913	C	0.41	0.065	0.024	0.039	0.045	0.379
24:0	rs2100944	G	0.22	0.053	0.024	0.039	0.047	0.399
24:0	rs11666913	C	0.41	0.071	0.025	0.039	0.045	0.379
BMI	rs1558902	A	0.42	0.082	0.003	0.010	0.031	0.751
BMI	rs6567160	C	0.24	0.056	0.004	-0.034	0.047	0.474
BMI	rs13021737	G	0.83	0.060	0.004	0.058	0.050	0.244
BMI	rs10938397	G	0.43	0.040	0.003	0.058	0.041	0.156
BMI	rs543874	G	0.19	0.048	0.004	-0.062	0.050	0.215
BMI	rs2207139	G	0.18	0.045	0.004	-0.068	0.053	0.200
BMI	rs11030104	A	0.79	0.041	0.004	0.020	0.055	0.720
BMI	rs3101336	C	0.61	0.033	0.003	0.058	0.038	0.127
BMI	rs7138803	A	0.38	0.032	0.003	-0.024	0.041	0.557
BMI	rs10182181	G	0.46	0.031	0.003	-0.022	0.041	0.584
BMI	rs3888190	A	0.40	0.031	0.003	0.001	0.014	0.944
BMI	rs1516725	C	0.87	0.045	0.005	-0.053	0.058	0.358
BMI	rs12446632	G	0.87	0.040	0.005	0.030	0.063	0.640
BMI	rs2287019	C	0.80	0.036	0.004	0.010	0.069	0.886
BMI	rs16951275	T	0.78	0.031	0.004	0.010	0.064	0.877
BMI	rs3817334	T	0.41	0.026	0.003	0.001	0.020	0.959
BMI	rs2112347	T	0.63	0.026	0.003	0.010	0.042	0.814
BMI	rs12566985	G	0.45	0.024	0.003	-0.021	0.041	0.605
BMI	rs3810291	A	0.67	0.028	0.004	-0.024	0.042	0.568
BMI	rs7141420	T	0.53	0.024	0.003	0.001	0.011	0.931
BMI	rs13078960	G	0.20	0.030	0.004	0.020	0.044	0.654
BMI	rs10968576	G	0.32	0.025	0.003	-0.040	0.043	0.353
BMI	rs17024393	C	0.04	0.066	0.009	-0.053	0.126	0.672
BMI	rs12429545	A	0.13	0.033	0.005	0.039	0.063	0.536
BMI	rs13107325	C	0.93	0.048	0.007	0.086	0.073	0.236
BMI	rs11165643	T	0.58	0.022	0.003	0.049	0.040	0.224
BMI	rs17405819	T	0.70	0.022	0.003	-0.109	0.044	0.013
BMI	rs1016287	T	0.29	0.023	0.003	-0.047	0.044	0.288
BMI	rs4256980	G	0.65	0.021	0.003	0.068	0.041	0.102
BMI	rs12401738	A	0.35	0.021	0.003	0.068	0.043	0.116
BMI	rs205262	G	0.27	0.022	0.004	0.010	0.066	0.879
BMI	rs12940622	G	0.57	0.018	0.003	-0.018	0.041	0.657
BMI	rs11847697	T	0.04	0.049	0.008	-0.140	0.099	0.155
BMI	rs2075650	G	0.14	0.026	0.005	-0.043	0.057	0.452
BMI	rs2121279	T	0.15	0.025	0.004	0.104	0.062	0.092
BMI	rs29941	G	0.67	0.018	0.003	0.020	0.043	0.648

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

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Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
BMI	rs6091540	C	0.72	0.019	0.004	-0.075	0.044	0.087
BMI	rs7715256	G	0.42	0.016	0.003	0.058	0.038	0.122
BMI	rs2176040	A	0.37	0.014	0.003	0.020	0.051	0.699
BMI	rs657452	A	0.39	0.023	0.003	0.058	0.039	0.137
BMI	rs12286929	G	0.52	0.022	0.003	0.030	0.043	0.488
BMI	rs7903146	T	0.27	0.023	0.003	-0.089	0.044	0.045
BMI	rs10132280	C	0.68	0.023	0.003	0.058	0.046	0.206
BMI	rs17094222	C	0.21	0.025	0.004	0.058	0.050	0.241
BMI	rs7599312	G	0.72	0.022	0.003	0.039	0.042	0.349
BMI	rs2365389	C	0.58	0.020	0.003	-0.050	0.041	0.220
BMI	rs2820292	C	0.56	0.020	0.003	0.010	0.031	0.747
BMI	rs12885454	C	0.64	0.021	0.003	0.030	0.046	0.519
BMI	rs16851483	T	0.07	0.048	0.008	0.020	0.085	0.816
BMI	rs1167827	G	0.55	0.020	0.003	0.039	0.042	0.353
BMI	rs758747	T	0.27	0.023	0.004	-0.060	0.045	0.185
BMI	rs1928295	T	0.55	0.019	0.003	-0.009	0.041	0.825
BMI	rs9925964	A	0.62	0.019	0.003	0.131	0.041	0.001
BMI	rs11126666	A	0.28	0.021	0.003	-0.120	0.046	0.009
BMI	rs2650492	A	0.30	0.021	0.004	-0.058	0.044	0.193
BMI	rs6804842	G	0.57	0.019	0.003	-0.020	0.041	0.626
BMI	rs4740619	T	0.54	0.018	0.003	-0.007	0.043	0.871
BMI	rs13191362	A	0.88	0.028	0.005	0.039	0.064	0.543
BMI	rs3736485	A	0.45	0.018	0.003	0.049	0.038	0.201
BMI	rs17001654	G	0.15	0.031	0.005	-0.049	0.057	0.391
BMI	rs11191560	C	0.09	0.031	0.005	0.058	0.080	0.466
BMI	rs1528435	T	0.63	0.018	0.003	0.010	0.031	0.751
BMI	rs1000940	G	0.32	0.019	0.003	0.001	0.021	0.962
BMI	rs2033529	G	0.29	0.019	0.003	-0.080	0.045	0.072
BMI	rs11583200	C	0.40	0.018	0.003	0.020	0.053	0.707
BMI	rs9400239	C	0.69	0.019	0.003	0.049	0.041	0.231
BMI	rs10733682	A	0.48	0.017	0.003	-0.044	0.041	0.282
BMI	rs11688816	G	0.52	0.017	0.003	-0.080	0.040	0.047
BMI	rs11057405	G	0.90	0.031	0.006	0.030	0.061	0.629
BMI	rs11727676	T	0.91	0.036	0.006	-0.020	0.067	0.764
BMI	rs3849570	A	0.36	0.019	0.003	0.058	0.039	0.138
BMI	rs6477694	C	0.37	0.017	0.003	-0.012	0.042	0.775
BMI	rs7899106	G	0.05	0.040	0.007	-0.124	0.092	0.175
BMI	rs2176598	T	0.25	0.020	0.004	0.010	0.089	0.911
BMI	rs2245368	C	0.18	0.032	0.006	0.039	0.060	0.516
BMI	rs17724992	A	0.75	0.019	0.004	0.068	0.044	0.125
BMI	rs7243357	T	0.81	0.022	0.004	-0.021	0.052	0.686
BMI	rs1808579	C	0.53	0.017	0.003	0.058	0.042	0.167
BMI	rs2033732	C	0.75	0.019	0.004	-0.035	0.046	0.457
BMI	rs1441264	A	0.61	0.018	0.003	-0.053	0.042	0.203

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
BMI	rs2080454	C	0.41	0.017	0.003	-0.026	0.041	0.523
BMI	rs7164727	T	0.69	0.018	0.003	0.020	0.039	0.614
BMI	rs17203016	G	0.20	0.021	0.004	-0.104	0.050	0.036
BMI	rs977747	T	0.39	0.017	0.003	-0.025	0.041	0.535
BMI	rs9914578	G	0.21	0.020	0.004	0.039	0.045	0.388
BMI	rs9374842	T	0.75	0.019	0.004	0.030	0.047	0.532
BMI	rs16907751	C	0.92	0.035	0.007	-0.177	0.068	0.010
BMI	rs9540493	A	0.46	0.017	0.003	-0.029	0.040	0.463
BMI	rs7239883	G	0.39	0.016	0.003	-0.014	0.040	0.724
BMI	rs13201877	G	0.14	0.023	0.005	-0.064	0.060	0.282
BMI	rs2836754	C	0.61	0.016	0.003	-0.020	0.042	0.631
BMI	rs492400	C	0.42	0.016	0.003	-0.026	0.041	0.523
BMI	rs9641123	C	0.43	0.019	0.004	0.068	0.041	0.096
BMI	rs1460676	C	0.17	0.020	0.004	0.020	0.072	0.784
BMI	rs4787491	G	0.51	0.016	0.003	-0.045	0.040	0.258
BMI	rs6465468	T	0.30	0.017	0.004	-0.042	0.044	0.339
Birth weight	rs13322435	A	0.59	0.052	0.004	0.068	0.041	0.099
Birth weight	rs1351394	T	0.48	0.043	0.004	-0.006	0.043	0.888
Birth weight	rs35261542	C	0.73	0.044	0.004	-0.068	0.046	0.136
Birth weight	rs11719201	T	0.23	0.046	0.004	0.010	0.054	0.855
Birth weight	rs7076938	T	0.73	0.035	0.004	0.030	0.043	0.494
Birth weight	rs925098	G	0.28	0.032	0.004	-0.010	0.046	0.826
Birth weight	rs854037	A	0.80	0.025	0.005	-0.022	0.051	0.660
Birth weight	rs1374204	T	0.70	0.046	0.004	0.039	0.052	0.447
Birth weight	rs138715366	C	0.99	0.244	0.023	-0.167	0.216	0.438
Birth weight	rs1101081	C	0.73	0.037	0.004	0.030	0.043	0.488
Birth weight	rs28510415	G	0.09	0.053	0.006	0.010	0.131	0.940
Birth weight	rs61862780	T	0.52	0.028	0.004	0.020	0.042	0.639
Birth weight	rs700059	G	0.16	0.036	0.005	-0.018	0.058	0.754
Birth weight	rs6537307	G	0.48	0.026	0.004	0.001	1.092	0.999
Birth weight	rs3753639	C	0.23	0.031	0.004	-0.011	0.049	0.820
Birth weight	rs62240962	C	0.92	0.047	0.007	0.001	0.026	0.970
Birth weight	rs62466330	C	0.07	0.051	0.007	-0.150	0.078	0.056
Birth weight	rs13266210	A	0.79	0.030	0.004	-0.104	0.049	0.034
Birth weight	rs1415701	G	0.73	0.027	0.004	0.086	0.048	0.074
Birth weight	rs28530618	A	0.50	0.024	0.004	0.010	0.044	0.819
Birth weight	rs6016377	T	0.45	0.024	0.004	0.020	0.039	0.610
Birth weight	rs10935733	T	0.42	0.023	0.004	0.049	0.041	0.236
Birth weight	rs72851023	T	0.07	0.046	0.007	-0.010	0.079	0.899
Birth weight	rs2473248	C	0.87	0.033	0.005	-0.058	0.063	0.360
Birth weight	rs7729301	A	0.72	0.025	0.004	-0.004	0.044	0.928
Birth weight	rs144843919	G	0.96	0.068	0.011	0.077	0.104	0.460
Birth weight	rs72480273	C	0.17	0.030	0.005	-0.044	0.052	0.402
Birth weight	rs1819436	C	0.87	0.033	0.005	-0.059	0.061	0.335

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Birth weight	rs74233809	C	0.08	0.039	0.006	0.049	0.076	0.521
Birth weight	rs12543725	G	0.60	0.022	0.004	-0.023	0.041	0.574
Birth weight	rs1011939	G	0.31	0.024	0.004	-0.006	0.049	0.901
Birth weight	rs798489	C	0.74	0.024	0.004	-0.004	0.048	0.934
Birth weight	rs2421016	T	0.48	0.021	0.004	-0.019	0.040	0.632
Birth weight	rs6040076	C	0.51	0.022	0.004	-0.046	0.040	0.250
Birth weight	rs2324499	G	0.67	0.023	0.004	0.020	0.049	0.683
Birth weight	rs7964361	A	0.08	0.038	0.007	-0.050	0.071	0.478
Birth weight	rs6959887	A	0.61	0.021	0.004	-0.038	0.042	0.365
Birth weight	rs7742369	G	0.19	0.027	0.005	-0.010	0.055	0.855
Birth weight	rs9379832	A	0.71	0.024	0.004	0.049	0.045	0.276
Birth weight	rs2242116	A	0.39	0.021	0.004	-0.009	0.042	0.831
Birth weight	rs2229742	G	0.87	0.034	0.006	-0.038	0.066	0.566
Birth weight	rs2854355	G	0.26	0.024	0.004	0.077	0.049	0.115
Birth weight	rs134594	C	0.35	0.022	0.004	0.068	0.043	0.111
Birth weight	rs11055034	C	0.73	0.023	0.004	-0.047	0.045	0.291
Birth weight	rs10402712	A	0.27	0.023	0.004	0.010	0.031	0.750
Birth weight	rs61154119	T	0.84	0.028	0.005	-0.001	0.107	0.993
Birth weight	rs2150052	T	0.50	0.020	0.004	-0.029	0.040	0.457
Birth weight	rs12823128	T	0.56	0.020	0.004	0.020	0.046	0.666
Birth weight	rs61830764	A	0.36	0.022	0.004	-0.022	0.041	0.590
Birth weight	rs6989280	G	0.70	0.022	0.004	-0.021	0.047	0.649
Height	rs425277	T	0.28	0.028	0.003	0.020	0.048	0.678
Height	rs9434723	A	0.16	0.029	0.004	-0.006	0.058	0.917
Height	rs10779751	A	0.28	0.021	0.003	0.001	0.040	0.980
Height	rs2284746	G	0.48	0.040	0.003	-0.024	0.041	0.552
Height	rs12137162	A	0.28	0.019	0.003	-0.057	0.045	0.212
Height	rs212524	C	0.60	0.021	0.003	0.058	0.044	0.181
Height	rs1014987	G	0.26	0.020	0.004	0.039	0.043	0.357
Height	rs2806561	A	0.57	0.027	0.003	0.030	0.035	0.397
Height	rs4601530	C	0.74	0.025	0.003	0.077	0.049	0.118
Height	rs926438	T	0.54	0.015	0.003	0.077	0.040	0.057
Height	rs17163588	T	0.18	0.027	0.004	0.030	0.047	0.530
Height	rs2219320	T	0.76	0.022	0.004	0.068	0.047	0.147
Height	rs12119525	A	0.36	0.018	0.003	0.049	0.044	0.269
Height	rs16834765	T	0.06	0.045	0.006	-0.017	0.084	0.838
Height	rs7544462	A	0.91	0.032	0.005	-0.043	0.073	0.557
Height	rs209918	A	0.78	0.023	0.004	-0.045	0.048	0.344
Height	rs6600365	C	0.44	0.027	0.003	-0.024	0.041	0.549
Height	rs3014219	G	0.54	0.021	0.003	0.068	0.040	0.089
Height	rs564914	T	0.39	0.024	0.003	0.030	0.046	0.520
Height	rs12855	T	0.09	0.038	0.005	0.049	0.076	0.520
Height	rs17387330	A	0.32	0.017	0.003	0.001	0.068	0.988
Height	rs6691924	T	0.90	0.032	0.005	-0.015	0.062	0.809

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs2815379	G	0.71	0.018	0.003	0.020	0.047	0.674
Height	rs17391694	T	0.12	0.043	0.005	-0.056	0.058	0.336
Height	rs2046158	C	0.84	0.021	0.004	-0.021	0.053	0.691
Height	rs7551732	A	0.61	0.027	0.003	0.020	0.051	0.696
Height	rs2811594	G	0.64	0.024	0.003	-0.013	0.042	0.753
Height	rs17113369	T	0.97	0.073	0.013	0.058	0.120	0.628
Height	rs7517682	G	0.44	0.023	0.003	-0.063	0.041	0.123
Height	rs12120956	G	0.78	0.025	0.004	-0.060	0.049	0.226
Height	rs1321666	C	0.48	0.017	0.003	-0.018	0.041	0.659
Height	rs9428104	G	0.76	0.043	0.003	0.068	0.046	0.142
Height	rs1409156	G	0.38	0.014	0.003	-0.070	0.042	0.095
Height	rs12144094	C	0.84	0.025	0.004	0.058	0.059	0.319
Height	rs6658763	C	0.92	0.036	0.005	0.058	0.074	0.430
Height	rs3767627	T	0.84	0.036	0.004	0.058	0.062	0.346
Height	rs956796	G	0.90	0.022	0.005	0.049	0.060	0.416
Height	rs2298265	C	0.90	0.030	0.005	-0.034	0.063	0.596
Height	rs6688100	T	0.48	0.016	0.003	-0.012	0.040	0.765
Height	rs4656220	T	0.39	0.021	0.003	0.039	0.043	0.367
Height	rs6694089	A	0.28	0.039	0.003	-0.035	0.045	0.439
Height	rs12125882	T	0.44	0.027	0.003	-0.075	0.041	0.066
Height	rs2421992	T	0.70	0.024	0.003	0.058	0.046	0.201
Height	rs17369123	T	0.19	0.031	0.004	-0.045	0.052	0.386
Height	rs1325596	A	0.57	0.025	0.003	-0.063	0.040	0.117
Height	rs4652773	A	0.46	0.024	0.003	0.058	0.043	0.171
Height	rs3814333	T	0.32	0.049	0.003	0.049	0.045	0.281
Height	rs2275325	C	0.28	0.019	0.003	0.049	0.044	0.268
Height	rs10863936	G	0.53	0.020	0.003	0.010	0.046	0.830
Height	rs6540834	C	0.66	0.027	0.003	0.020	0.048	0.682
Height	rs1244981	A	0.84	0.025	0.004	-0.059	0.055	0.285
Height	rs10495098	T	0.41	0.019	0.003	0.020	0.046	0.668
Height	rs991967	C	0.29	0.034	0.003	0.010	0.037	0.791
Height	rs12411277	G	0.64	0.022	0.003	0.049	0.042	0.249
Height	rs4428898	G	0.54	0.023	0.003	-0.052	0.040	0.193
Height	rs1935157	G	0.30	0.025	0.003	-0.047	0.044	0.289
Height	rs1544196	G	0.78	0.019	0.004	0.020	0.046	0.669
Height	rs6696239	G	0.82	0.038	0.004	-0.105	0.051	0.038
Height	rs11799609	T	0.16	0.026	0.004	0.049	0.055	0.379
Height	rs17038954	T	0.06	0.044	0.006	0.095	0.084	0.258
Height	rs10048625	T	0.18	0.027	0.004	-0.071	0.054	0.183
Height	rs3885668	C	0.43	0.022	0.003	-0.015	0.040	0.707
Height	rs2345835	C	0.54	0.018	0.003	-0.004	0.038	0.915
Height	rs13006748	C	0.30	0.023	0.003	0.068	0.044	0.120
Height	rs7561273	G	0.55	0.025	0.003	0.068	0.041	0.097
Height	rs2278483	T	0.24	0.041	0.003	0.020	0.060	0.741

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs2289195	A	0.43	0.038	0.003	0.010	0.046	0.827
Height	rs10460566	A	0.76	0.007	0.004	0.010	0.040	0.801
Height	rs780094	T	0.41	0.021	0.003	0.068	0.039	0.081
Height	rs7605699	G	0.81	0.028	0.004	0.030	0.044	0.502
Height	rs6714546	G	0.72	0.030	0.003	-0.065	0.044	0.143
Height	rs6751657	C	0.53	0.024	0.003	-0.011	0.041	0.789
Height	rs711245	G	0.67	0.024	0.003	0.068	0.045	0.133
Height	rs6544089	T	0.39	0.020	0.003	-0.027	0.041	0.506
Height	rs17511102	T	0.19	0.053	0.006	-0.002	0.080	0.980
Height	rs12615742	T	0.48	0.026	0.004	0.030	0.043	0.496
Height	rs13416119	A	0.90	0.029	0.005	0.095	0.069	0.169
Height	rs9309101	G	0.34	0.021	0.003	-0.101	0.042	0.016
Height	rs897080	C	0.26	0.028	0.003	-0.036	0.047	0.453
Height	rs17032525	A	0.13	0.025	0.005	0.010	0.061	0.870
Height	rs12474201	A	0.36	0.028	0.003	-0.035	0.042	0.411
Height	rs354196	G	0.54	0.021	0.003	-0.006	0.043	0.889
Height	rs1367226	G	0.57	0.005	0.003	0.010	0.064	0.877
Height	rs3791679	A	0.77	0.060	0.004	0.039	0.049	0.427
Height	rs3791673	G	0.96	0.012	0.008	0.140	0.101	0.166
Height	rs2120335	G	0.60	0.019	0.003	0.030	0.039	0.447
Height	rs7568069	G	0.43	0.022	0.003	0.010	0.037	0.789
Height	rs11684404	C	0.34	0.032	0.003	0.086	0.044	0.053
Height	rs11683207	T	0.80	0.023	0.004	-0.024	0.056	0.665
Height	rs13388725	G	0.41	0.018	0.003	-0.042	0.041	0.304
Height	rs2166898	G	0.84	0.027	0.004	-0.022	0.053	0.674
Height	rs7567288	C	0.21	0.029	0.004	0.049	0.052	0.347
Height	rs4953951	C	0.90	0.036	0.005	-0.111	0.078	0.153
Height	rs749234	A	0.32	0.017	0.003	0.058	0.046	0.205
Height	rs540652	T	0.46	0.021	0.003	0.010	0.035	0.779
Height	rs12987566	T	0.27	0.024	0.003	-0.003	0.053	0.955
Height	rs6746356	A	0.75	0.019	0.003	-0.191	0.047	3.9756e-05
Height	rs7567851	C	0.08	0.039	0.006	-0.028	0.075	0.704
Height	rs833152	C	0.42	0.017	0.003	-0.042	0.040	0.297
Height	rs12693589	C	0.25	0.022	0.003	0.058	0.046	0.208
Height	rs6435143	A	0.44	0.019	0.003	-0.054	0.040	0.178
Height	rs4425077	G	0.41	0.020	0.003	-0.048	0.041	0.235
Height	rs12329133	C	0.61	0.017	0.003	0.010	0.046	0.829
Height	rs17181956	C	0.88	0.028	0.005	-0.082	0.065	0.205
Height	rs994533	G	0.67	0.027	0.003	-0.013	0.042	0.754
Height	rs1864439	T	0.89	0.027	0.005	0.010	0.097	0.918
Height	rs992157	A	0.57	0.022	0.003	0.039	0.039	0.310
Height	rs2305833	C	0.58	0.028	0.003	-0.025	0.040	0.529
Height	rs4674354	T	0.77	0.004	0.004	0.086	0.049	0.079
Height	rs12470505	T	0.90	0.048	0.005	0.039	0.063	0.531

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).



**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs16859517	T	0.04	0.067	0.008	0.068	0.108	0.532
Height	rs12621643	G	0.71	0.017	0.003	0.020	0.040	0.622
Height	rs6761041	T	0.55	0.023	0.003	-0.021	0.041	0.604
Height	rs6733349	T	0.66	0.022	0.003	0.001	0.009	0.912
Height	rs6754426	G	0.56	0.027	0.003	0.010	0.033	0.763
Height	rs4973429	G	0.66	0.029	0.003	-0.027	0.042	0.516
Height	rs2679184	T	0.77	0.031	0.004	0.010	0.047	0.834
Height	rs749052	T	0.94	0.067	0.006	-0.211	0.084	0.012
Height	rs11677466	T	0.10	0.064	0.007	0.030	0.063	0.638
Height	rs3116168	C	0.74	0.039	0.003	-0.077	0.045	0.086
Height	rs2343240	T	0.97	0.078	0.010	0.113	0.143	0.427
Height	rs13393800	A	0.29	0.027	0.003	0.010	0.045	0.825
Height	rs4344931	C	0.71	0.020	0.003	0.001	0.038	0.979
Height	rs11687941	C	0.75	0.025	0.003	-0.049	0.048	0.305
Height	rs2633761	A	0.50	0.016	0.003	0.049	0.042	0.247
Height	rs13078528	A	0.94	0.045	0.006	-0.100	0.094	0.287
Height	rs2596831	G	0.57	0.017	0.003	0.010	0.061	0.871
Height	rs2597513	C	0.11	0.039	0.005	-0.067	0.066	0.308
Height	rs11708412	A	0.26	0.019	0.004	-0.068	0.046	0.134
Height	rs9816693	C	0.17	0.031	0.004	-0.015	0.051	0.766
Height	rs3915129	G	0.47	0.016	0.003	-0.013	0.041	0.750
Height	rs13088462	C	0.06	0.059	0.007	-0.051	0.092	0.579
Height	rs4256170	A	0.01	0.191	0.028	-0.011	0.133	0.934
Height	rs2240919	C	0.66	0.027	0.003	-0.088	0.043	0.042
Height	rs2581830	T	0.40	0.031	0.003	-0.039	0.041	0.343
Height	rs2034172	G	0.69	0.018	0.003	0.001	0.111	0.993
Height	rs9835332	G	0.54	0.028	0.003	-0.042	0.040	0.296
Height	rs1658351	C	0.36	0.023	0.003	-0.025	0.042	0.547
Height	rs6794009	G	0.44	0.016	0.003	0.001	0.009	0.915
Height	rs17806888	T	0.88	0.034	0.005	0.030	0.054	0.583
Height	rs2175513	G	0.44	0.017	0.003	0.039	0.041	0.340
Height	rs12330322	C	0.79	0.034	0.004	-0.007	0.050	0.887
Height	rs7633464	A	0.48	0.019	0.003	0.001	0.015	0.946
Height	rs1797625	T	0.36	0.019	0.003	0.030	0.045	0.507
Height	rs1533269	C	0.70	0.020	0.003	-0.049	0.043	0.257
Height	rs1546391	G	0.10	0.039	0.006	0.095	0.079	0.230
Height	rs6439168	G	0.80	0.037	0.004	-0.021	0.048	0.656
Height	rs4974480	T	0.70	0.026	0.003	-0.016	0.043	0.706
Height	rs6762606	C	0.77	0.001	0.003	0.039	0.044	0.368
Height	rs9880211	G	0.76	0.030	0.003	-0.043	0.047	0.357
Height	rs724016	G	0.45	0.078	0.003	0.049	0.043	0.255
Height	rs11714558	T	0.97	0.134	0.019	-0.161	0.145	0.265
Height	rs936339	T	0.19	0.022	0.004	-0.079	0.051	0.119
Height	rs4325879	C	0.74	0.021	0.004	0.039	0.052	0.453

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs6441170	C	0.38	0.022	0.003	0.157	0.043	0.000
Height	rs7652177	G	0.51	0.038	0.003	-0.061	0.040	0.130
Height	rs509035	A	0.32	0.031	0.003	-0.045	0.043	0.295
Height	rs9858528	A	0.74	0.022	0.003	0.020	0.041	0.628
Height	rs16860216	A	0.24	0.001	0.004	0.068	0.046	0.141
Height	rs720390	A	0.38	0.035	0.003	-0.081	0.042	0.052
Height	rs2300921	C	0.42	0.018	0.003	0.001	0.025	0.969
Height	rs4686904	C	0.35	0.021	0.003	0.039	0.047	0.403
Height	rs7646824	A	0.89	0.026	0.005	0.010	0.102	0.922
Height	rs9841435	G	0.33	0.020	0.003	-0.045	0.043	0.296
Height	rs3958122	T	0.35	0.027	0.003	0.049	0.039	0.213
Height	rs867245	C	0.94	0.041	0.006	0.039	0.095	0.679
Height	rs11722554	G	0.96	0.063	0.010	-0.011	0.111	0.921
Height	rs6446315	G	0.20	0.028	0.004	0.020	0.046	0.670
Height	rs868489	C	0.80	0.021	0.004	-0.048	0.047	0.308
Height	rs6829680	A	0.44	0.017	0.003	-0.007	0.043	0.871
Height	rs2302580	C	0.60	0.029	0.004	-0.063	0.041	0.125
Height	rs763318	G	0.54	0.021	0.003	-0.027	0.041	0.502
Height	rs4834927	G	0.34	0.019	0.003	-0.036	0.043	0.404
Height	rs7692995	T	0.85	0.074	0.004	-0.108	0.055	0.049
Height	rs961014	A	0.42	0.000	0.003	0.049	0.039	0.207
Height	rs16994718	C	0.85	0.025	0.004	-0.050	0.060	0.399
Height	rs2306596	A	0.52	0.019	0.003	-0.023	0.039	0.556
Height	rs1996422	G	0.28	0.022	0.003	-0.060	0.044	0.178
Height	rs13113518	C	0.37	0.018	0.003	0.095	0.040	0.017
Height	rs17081935	T	0.20	0.031	0.004	0.058	0.054	0.283
Height	rs9993613	T	0.47	0.030	0.003	-0.024	0.040	0.539
Height	rs17556750	A	0.31	0.046	0.003	-0.016	0.045	0.723
Height	rs2167645	T	0.04	0.139	0.021	-0.053	0.129	0.680
Height	rs17499117	G	0.10	0.140	0.021	0.010	0.087	0.909
Height	rs11731978	A	0.86	0.023	0.004	0.010	0.079	0.900
Height	rs6813055	A	0.49	0.017	0.003	0.068	0.041	0.102
Height	rs12639764	T	0.62	0.027	0.003	0.049	0.042	0.244
Height	rs1562975	A	0.30	0.025	0.003	0.039	0.047	0.405
Height	rs7659107	G	0.23	0.024	0.004	0.086	0.046	0.064
Height	rs6838153	G	0.34	0.022	0.003	0.039	0.048	0.417
Height	rs12513181	C	0.27	0.020	0.003	-0.014	0.045	0.754
Height	rs11100790	C	0.21	0.025	0.004	0.001	0.252	0.997
Height	rs7654571	A	0.23	0.022	0.004	0.020	0.053	0.709
Height	rs6845999	T	0.44	0.051	0.003	-0.012	0.042	0.774
Height	rs1812175	G	0.84	0.079	0.004	0.030	0.047	0.525
Height	rs1777628	G	0.96	0.053	0.008	0.086	0.112	0.440
Height	rs4240326	A	0.46	0.040	0.003	-0.006	0.044	0.890
Height	rs996743	A	0.92	0.063	0.007	0.039	0.078	0.614

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs13133465	C	0.93	0.045	0.007	0.131	0.092	0.155
Height	rs13150868	T	0.44	0.017	0.003	-0.001	0.034	0.976
Height	rs955748	G	0.76	0.028	0.003	0.030	0.055	0.591
Height	rs17410035	T	0.33	0.019	0.003	0.039	0.042	0.347
Height	rs7731703	C	0.70	0.030	0.003	0.068	0.044	0.124
Height	rs3811958	G	0.27	0.027	0.003	-0.023	0.046	0.615
Height	rs9292468	T	0.40	0.036	0.003	0.010	0.039	0.797
Height	rs13183624	A	0.76	0.019	0.003	-0.039	0.048	0.418
Height	rs11745439	G	0.72	0.026	0.003	0.030	0.050	0.551
Height	rs1004202	G	0.40	0.016	0.003	-0.015	0.041	0.713
Height	rs301901	A	0.57	0.024	0.003	0.049	0.039	0.212
Height	rs3812040	T	0.72	0.024	0.003	-0.052	0.044	0.238
Height	rs17574650	C	0.12	0.038	0.005	-0.028	0.066	0.667
Height	rs2961830	A	0.35	0.020	0.003	-0.012	0.044	0.783
Height	rs7716219	T	0.31	0.030	0.003	0.049	0.041	0.237
Height	rs2662027	G	0.90	0.033	0.005	0.039	0.060	0.513
Height	rs7727731	T	0.11	0.033	0.005	0.077	0.058	0.181
Height	rs9291926	T	0.49	0.019	0.003	-0.067	0.040	0.092
Height	rs34651	C	0.08	0.041	0.006	-0.093	0.073	0.205
Height	rs820848	G	0.30	0.021	0.004	0.086	0.046	0.061
Height	rs12519505	C	0.80	0.022	0.004	-0.033	0.047	0.485
Height	rs7712162	T	0.19	0.023	0.004	0.068	0.056	0.225
Height	rs32855	A	0.78	0.024	0.004	-0.006	0.048	0.900
Height	rs6894139	T	0.56	0.030	0.003	0.010	0.039	0.797
Height	rs2247870	A	0.55	0.016	0.003	-0.043	0.040	0.287
Height	rs12186664	T	0.33	0.021	0.003	-0.018	0.043	0.671
Height	rs6594336	C	0.57	0.017	0.003	-0.061	0.041	0.134
Height	rs13177718	C	0.93	0.043	0.006	0.166	0.077	0.031
Height	rs1582931	G	0.53	0.028	0.003	0.020	0.051	0.697
Height	rs6887276	G	0.46	0.018	0.003	-0.004	0.036	0.911
Height	rs26024	C	0.35	0.023	0.003	0.010	0.041	0.810
Height	rs39623	A	0.08	0.034	0.005	-0.076	0.075	0.313
Height	rs7701414	G	0.45	0.037	0.003	0.030	0.043	0.487
Height	rs6596075	G	0.17	0.014	0.004	-0.039	0.054	0.476
Height	rs526896	T	0.73	0.036	0.003	0.077	0.047	0.101
Height	rs9327705	A	0.23	0.020	0.004	-0.050	0.048	0.297
Height	rs165189	G	0.15	0.029	0.005	-0.036	0.057	0.534
Height	rs4624820	A	0.52	0.018	0.003	0.030	0.041	0.468
Height	rs2974438	G	0.80	0.037	0.004	0.039	0.055	0.472
Height	rs4620037	A	0.80	0.032	0.004	0.058	0.046	0.203
Height	rs1529701	C	0.70	0.021	0.003	-0.038	0.044	0.387
Height	rs33852	G	0.33	0.030	0.003	-0.027	0.042	0.518
Height	rs12153391	C	0.75	0.033	0.004	-0.064	0.047	0.171
Height	rs4868126	G	0.61	0.036	0.003	0.010	0.030	0.744

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs1368380	T	0.44	0.032	0.003	0.039	0.041	0.336
Height	rs17075869	T	0.08	0.027	0.005	-0.004	0.068	0.953
Height	rs7733195	G	0.65	0.029	0.003	-0.025	0.041	0.541
Height	rs4868645	G	0.50	0.014	0.003	0.039	0.044	0.369
Height	rs422421	C	0.80	0.034	0.004	-0.015	0.049	0.760
Height	rs11950938	G	0.03	0.061	0.009	0.199	0.137	0.148
Height	rs12055154	A	0.97	0.059	0.010	-0.052	0.127	0.681
Height	rs11750568	A	0.33	0.020	0.003	-0.067	0.042	0.112
Height	rs6879260	C	0.61	0.027	0.003	0.030	0.048	0.541
Height	rs932445	T	0.59	0.018	0.003	0.039	0.044	0.372
Height	rs163071	C	0.98	0.061	0.011	-0.180	0.148	0.223
Height	rs4246079	G	0.88	0.038	0.005	0.010	0.057	0.862
Height	rs17603945	A	0.20	0.030	0.004	0.030	0.050	0.554
Height	rs9392918	C	0.48	0.038	0.003	0.039	0.039	0.319
Height	rs9328445	C	0.55	0.014	0.003	-0.026	0.040	0.506
Height	rs9405356	T	0.61	0.004	0.003	-0.031	0.041	0.439
Height	rs17330192	C	0.28	0.019	0.003	0.104	0.046	0.024
Height	rs1047014	C	0.25	0.032	0.004	0.058	0.050	0.245
Height	rs4141885	A	0.92	0.073	0.008	-0.051	0.075	0.494
Height	rs806794	A	0.71	0.060	0.003	-0.037	0.045	0.416
Height	rs1233627	T	0.50	0.024	0.003	0.030	0.035	0.397
Height	rs1265097	C	0.89	0.059	0.005	-0.042	0.073	0.569
Height	rs6457374	C	0.27	0.041	0.003	-0.017	0.043	0.690
Height	rs2857693	G	0.62	0.034	0.003	0.030	0.048	0.539
Height	rs3129254	A	0.59	0.018	0.003	0.010	0.055	0.857
Height	rs12204421	A	0.74	0.027	0.003	-0.048	0.046	0.296
Height	rs3957165	T	0.81	0.022	0.004	-0.016	0.050	0.745
Height	rs12214804	C	0.08	0.084	0.006	-0.037	0.070	0.601
Height	rs3800461	C	0.13	0.053	0.005	0.049	0.060	0.420
Height	rs6919534	A	0.87	0.050	0.004	-0.134	0.058	0.020
Height	rs6899744	G	0.90	0.132	0.014	0.030	0.135	0.826
Height	rs4713902	T	0.73	0.027	0.004	-0.058	0.046	0.206
Height	rs16895130	G	0.28	0.023	0.003	0.030	0.048	0.538
Height	rs1040941	A	0.40	0.016	0.003	0.030	0.036	0.413
Height	rs10948222	C	0.60	0.031	0.003	0.077	0.042	0.064
Height	rs9395264	G	0.70	0.020	0.003	0.020	0.054	0.712
Height	rs12190423	G	0.63	0.017	0.003	-0.029	0.042	0.479
Height	rs12209223	A	0.12	0.051	0.005	-0.041	0.067	0.545
Height	rs6903448	C	0.85	0.035	0.004	-0.026	0.057	0.642
Height	rs648831	T	0.50	0.031	0.003	-0.004	0.041	0.922
Height	rs1341278	G	0.10	0.056	0.006	0.020	0.109	0.856
Height	rs9443804	G	0.44	0.024	0.003	-0.006	0.037	0.872
Height	rs310421	T	0.54	0.032	0.003	0.010	0.029	0.731
Height	rs3828760	T	0.12	0.030	0.005	-0.003	0.071	0.966

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs761391	C	0.46	0.019	0.003	-0.017	0.040	0.668
Height	rs314263	C	0.33	0.043	0.003	-0.034	0.042	0.428
Height	rs479744	G	0.79	0.025	0.004	-0.017	0.052	0.741
Height	rs6920372	G	0.59	0.025	0.003	0.001	0.045	0.982
Height	rs2145357	G	0.27	0.021	0.003	-0.040	0.044	0.365
Height	rs1405212	C	0.60	0.023	0.003	0.039	0.047	0.404
Height	rs389663	T	0.32	0.022	0.003	-0.041	0.043	0.339
Height	rs4895801	G	0.47	0.017	0.003	0.001	0.012	0.935
Height	rs1155939	A	0.50	0.042	0.003	0.020	0.049	0.686
Height	rs1415701	G	0.73	0.044	0.004	0.086	0.048	0.074
Height	rs7740107	T	0.27	0.042	0.003	0.058	0.045	0.191
Height	rs6921207	A	0.37	0.023	0.003	0.020	0.038	0.600
Height	rs7743622	G	0.58	0.017	0.003	-0.033	0.040	0.420
Height	rs7745166	C	0.57	0.026	0.003	-0.056	0.042	0.184
Height	rs4896582	G	0.70	0.051	0.003	0.001	0.009	0.914
Height	rs6911389	T	0.35	0.015	0.003	-0.004	0.039	0.917
Height	rs2748483	A	0.55	0.019	0.003	-0.026	0.040	0.510
Height	rs6902771	T	0.46	0.031	0.003	-0.033	0.040	0.420
Height	rs3020418	A	0.30	0.032	0.003	-0.037	0.044	0.409
Height	rs11156098	T	0.12	0.027	0.005	0.020	0.084	0.813
Height	rs1832871	A	0.34	0.025	0.003	-0.038	0.042	0.373
Height	rs9456307	T	0.94	0.053	0.007	-0.044	0.087	0.612
Height	rs486359	C	0.49	0.016	0.003	-0.043	0.040	0.285
Height	rs991946	C	0.52	0.021	0.003	-0.071	0.040	0.076
Height	rs2763273	C	0.76	0.022	0.003	0.010	0.045	0.823
Height	rs7774834	A	0.51	0.018	0.003	0.030	0.047	0.526
Height	rs798497	A	0.70	0.057	0.003	-0.021	0.043	0.624
Height	rs4725061	G	0.44	0.020	0.003	-0.041	0.040	0.308
Height	rs929637	G	0.78	0.021	0.004	-0.014	0.049	0.772
Height	rs17140875	G	0.95	0.043	0.007	-0.071	0.091	0.431
Height	rs2390151	T	0.18	0.033	0.004	-0.007	0.051	0.891
Height	rs3807931	A	0.45	0.027	0.003	-0.037	0.040	0.361
Height	rs7782764	G	0.87	0.001	0.004	-0.026	0.057	0.643
Height	rs12538407	A	0.60	0.032	0.003	-0.042	0.040	0.300
Height	rs1055144	T	0.19	0.021	0.004	0.077	0.052	0.135
Height	rs552707	T	0.31	0.046	0.003	-0.022	0.044	0.615
Height	rs12533079	T	0.79	0.022	0.004	0.077	0.054	0.151
Height	rs6462432	A	0.39	0.017	0.003	0.068	0.039	0.085
Height	rs6974574	T	0.69	0.030	0.003	-0.041	0.042	0.335
Height	rs1007358	G	0.23	0.021	0.004	-0.027	0.049	0.579
Height	rs6949739	T	0.91	0.038	0.005	-0.106	0.074	0.149
Height	rs2715094	G	0.25	0.021	0.003	0.068	0.044	0.126
Height	rs1113765	G	0.82	0.024	0.004	0.049	0.050	0.332
Height	rs12669267	C	0.87	0.029	0.005	0.010	0.046	0.829

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs17807185	G	0.39	0.022	0.003	-0.099	0.041	0.015
Height	rs2888877	T	0.22	0.066	0.004	-0.004	0.056	0.943
Height	rs42039	C	0.77	0.068	0.003	0.010	0.047	0.831
Height	rs2188177	T	0.47	0.015	0.003	0.010	0.030	0.741
Height	rs6971575	C	0.29	0.021	0.004	0.030	0.051	0.562
Height	rs17250196	T	0.07	0.045	0.007	-0.223	0.090	0.014
Height	rs6952113	G	0.62	0.018	0.003	0.030	0.046	0.518
Height	rs6962887	T	0.68	0.023	0.003	-0.034	0.043	0.437
Height	rs273945	C	0.60	0.019	0.003	-0.011	0.041	0.787
Height	rs822531	T	0.78	0.036	0.004	0.049	0.054	0.371
Height	rs6955948	T	0.28	0.031	0.003	-0.109	0.045	0.016
Height	rs4875421	T	0.45	0.019	0.003	0.010	0.047	0.832
Height	rs429433	A	0.05	0.046	0.007	0.191	0.092	0.038
Height	rs7834383	T	0.36	0.022	0.003	0.077	0.044	0.081
Height	rs7823327	T	0.48	0.019	0.003	-0.046	0.040	0.251
Height	rs4273857	A	0.23	0.027	0.003	0.010	0.061	0.870
Height	rs17088184	G	0.20	0.025	0.004	-0.056	0.054	0.308
Height	rs2013265	C	0.75	0.028	0.003	0.077	0.047	0.104
Height	rs3812423	G	0.65	0.021	0.003	-0.005	0.039	0.898
Height	rs568610	T	0.24	0.022	0.003	-0.013	0.046	0.774
Height	rs6988484	C	0.26	0.022	0.003	-0.005	0.042	0.906
Height	rs6999671	A	0.04	0.033	0.008	-0.114	0.105	0.278
Height	rs10958476	C	0.22	0.051	0.004	-0.048	0.049	0.327
Height	rs9650315	G	0.87	0.061	0.005	-0.077	0.060	0.198
Height	rs2956605	A	0.38	0.024	0.003	-0.031	0.041	0.442
Height	rs16939034	T	0.09	0.025	0.006	0.049	0.077	0.527
Height	rs4735677	T	0.29	0.037	0.003	0.020	0.057	0.727
Height	rs7007200	G	0.70	0.017	0.003	-0.011	0.044	0.803
Height	rs2737220	T	0.38	0.017	0.003	0.039	0.042	0.355
Height	rs1550162	G	0.30	0.024	0.003	0.010	0.060	0.869
Height	rs1599473	G	0.76	0.027	0.003	0.039	0.042	0.356
Height	rs10283100	G	0.96	0.057	0.009	-0.034	0.088	0.702
Height	rs11779459	T	0.35	0.016	0.003	-0.017	0.042	0.686
Height	rs8180991	C	0.77	0.028	0.004	-0.021	0.047	0.655
Height	rs4733724	A	0.80	0.050	0.004	-0.005	0.052	0.922
Height	rs894343	A	0.29	0.012	0.003	-0.006	0.045	0.894
Height	rs1036821	G	0.70	0.037	0.003	-0.016	0.043	0.707
Height	rs6577717	T	0.67	0.002	0.003	0.039	0.044	0.377
Height	rs11783655	T	0.61	0.018	0.003	0.058	0.042	0.164
Height	rs7033940	G	0.88	0.024	0.004	0.010	0.045	0.823
Height	rs2149163	C	0.40	0.020	0.003	0.095	0.042	0.023
Height	rs3927536	T	0.78	0.021	0.004	0.020	0.061	0.746
Height	rs10962832	A	0.84	0.024	0.004	-0.003	0.053	0.955
Height	rs1576900	G	0.70	0.019	0.003	-0.004	0.044	0.928

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs3763631	C	0.69	0.019	0.003	-0.037	0.043	0.397
Height	rs10972628	G	0.75	0.017	0.003	-0.037	0.046	0.428
Height	rs11144688	G	0.90	0.063	0.006	-0.075	0.062	0.228
Height	rs958225	A	0.05	0.046	0.008	-0.027	0.087	0.753
Height	rs7853235	T	0.20	0.029	0.004	-0.063	0.051	0.218
Height	rs181338	T	0.51	0.028	0.003	0.058	0.038	0.126
Height	rs10780910	T	0.43	0.027	0.003	0.030	0.042	0.484
Height	rs1571892	C	0.30	0.016	0.003	-0.004	0.050	0.936
Height	rs7043114	C	0.44	0.029	0.003	-0.010	0.041	0.806
Height	rs1257763	A	0.04	0.078	0.010	-0.006	0.094	0.949
Height	rs12347744	C	0.94	0.039	0.006	0.001	0.079	0.990
Height	rs4448343	G	0.35	0.035	0.003	0.020	0.035	0.576
Height	rs1329393	T	0.16	0.034	0.005	-0.190	0.052	0.000
Height	rs817300	G	0.93	0.085	0.007	0.030	0.076	0.697
Height	rs10990303	T	0.23	0.036	0.004	-0.045	0.048	0.350
Height	rs7870753	G	0.23	0.043	0.004	0.001	0.028	0.971
Height	rs953199	C	0.77	0.019	0.004	-0.050	0.046	0.278
Height	rs989393	T	0.71	0.022	0.003	0.020	0.037	0.591
Height	rs10820814	C	0.91	0.027	0.005	0.001	0.031	0.974
Height	rs9409082	C	0.76	0.028	0.004	-0.043	0.048	0.367
Height	rs902143	T	0.45	0.020	0.003	-0.012	0.040	0.764
Height	rs2451948	G	0.20	0.022	0.004	-0.043	0.055	0.435
Height	rs7027110	A	0.23	0.032	0.003	0.010	0.037	0.790
Height	rs3739707	C	0.76	0.024	0.004	-0.011	0.044	0.803
Height	rs999599	T	0.37	0.016	0.003	0.058	0.045	0.193
Height	rs10759774	A	0.66	0.011	0.003	-0.041	0.041	0.324
Height	rs10119624	A	0.67	0.024	0.003	-0.051	0.043	0.233
Height	rs12344396	C	0.62	0.019	0.003	-0.026	0.042	0.528
Height	rs7033487	T	0.79	0.037	0.004	-0.031	0.050	0.533
Height	rs1742829	T	0.10	0.037	0.006	-0.080	0.070	0.253
Height	rs10817960	A	0.16	0.023	0.005	-0.104	0.055	0.059
Height	rs7466269	A	0.64	0.033	0.003	0.010	0.049	0.838
Height	rs3132297	G	0.83	0.023	0.004	-0.029	0.054	0.586
Height	rs7849585	T	0.33	0.036	0.003	-0.024	0.042	0.560
Height	rs3812591	C	0.28	0.024	0.003	0.020	0.052	0.702
Height	rs4332428	A	0.88	0.036	0.005	0.068	0.060	0.261
Height	rs12779328	C	0.72	0.028	0.003	-0.048	0.045	0.283
Height	rs4350272	A	0.28	0.020	0.003	0.039	0.046	0.398
Height	rs7069985	G	0.25	0.023	0.003	0.039	0.044	0.376
Height	rs10995319	T	0.76	0.019	0.003	0.030	0.048	0.541
Height	rs1171615	C	0.22	0.022	0.004	-0.082	0.048	0.085
Height	rs10997979	G	0.50	0.021	0.003	0.001	0.100	0.992
Height	rs4746769	T	0.86	0.029	0.004	-0.029	0.061	0.629
Height	rs1815314	G	0.58	0.022	0.003	0.068	0.042	0.108

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs703985	T	0.42	0.006	0.003	0.010	0.046	0.829
Height	rs1923367	G	0.52	0.030	0.003	0.010	0.068	0.883
Height	rs2631676	G	0.20	0.028	0.004	0.086	0.051	0.093
Height	rs915506	G	0.65	0.021	0.003	-0.039	0.042	0.353
Height	rs11599750	C	0.63	0.023	0.003	-0.010	0.039	0.798
Height	rs10883563	A	0.55	0.023	0.003	0.010	0.030	0.736
Height	rs7899004	T	0.56	0.025	0.003	0.039	0.041	0.333
Height	rs6584575	A	0.10	0.034	0.005	0.020	0.069	0.774
Height	rs11198820	C	0.11	0.025	0.005	-0.106	0.066	0.107
Height	rs291979	A	0.23	0.029	0.004	0.020	0.062	0.750
Height	rs1614303	T	0.83	0.022	0.004	0.039	0.058	0.496
Height	rs7097701	C	0.50	0.015	0.003	-0.019	0.041	0.639
Height	rs10794175	T	0.43	0.020	0.003	-0.075	0.041	0.068
Height	rs11245515	T	0.56	0.017	0.003	-0.047	0.040	0.244
Height	rs11244750	T	0.32	0.018	0.003	0.058	0.042	0.163
Height	rs2272566	A	0.48	0.016	0.003	-0.003	0.039	0.938
Height	rs2735469	A	0.16	0.029	0.005	0.001	0.167	0.995
Height	rs4320932	T	0.82	0.029	0.004	0.001	0.033	0.976
Height	rs17659078	A	0.27	0.021	0.003	-0.050	0.045	0.269
Height	rs2237886	T	0.11	0.043	0.005	0.068	0.064	0.292
Height	rs6485978	C	0.46	0.023	0.003	-0.054	0.040	0.174
Height	rs2099745	G	0.92	0.036	0.006	0.039	0.080	0.624
Height	rs10766065	C	0.28	0.019	0.003	-0.029	0.044	0.507
Height	rs7126398	C	0.08	0.041	0.006	0.077	0.085	0.363
Height	rs2915404	T	0.40	0.014	0.003	0.020	0.039	0.614
Height	rs757081	G	0.35	0.024	0.003	0.068	0.041	0.100
Height	rs10767838	A	0.72	0.025	0.003	0.010	0.041	0.806
Height	rs3802758	A	0.94	0.039	0.007	0.030	0.073	0.686
Height	rs1681630	T	0.34	0.029	0.003	0.030	0.038	0.436
Height	rs1945237	C	0.10	0.022	0.005	-0.099	0.074	0.181
Height	rs3782089	C	0.94	0.053	0.007	0.077	0.078	0.321
Height	rs7112925	C	0.65	0.024	0.003	0.095	0.041	0.021
Height	rs2510396	C	0.86	0.029	0.004	-0.089	0.056	0.112
Height	rs3750972	G	0.49	0.019	0.003	-0.015	0.040	0.703
Height	rs4357716	T	0.14	0.031	0.005	0.001	0.020	0.961
Height	rs2509133	C	0.50	0.019	0.003	-0.009	0.042	0.828
Height	rs11236294	T	0.29	0.019	0.003	-0.005	0.046	0.914
Height	rs606452	A	0.14	0.043	0.004	0.030	0.053	0.574
Height	rs632124	A	0.42	0.023	0.003	-0.028	0.041	0.491
Height	rs10790381	A	0.82	0.027	0.004	-0.008	0.056	0.887
Height	rs1461503	C	0.57	0.018	0.003	-0.002	0.037	0.956
Height	rs11221442	G	0.76	0.027	0.004	-0.101	0.046	0.029
Height	rs11612228	T	0.38	0.020	0.003	0.010	0.046	0.829
Height	rs7299326	C	0.95	0.041	0.007	0.174	0.093	0.061

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).



**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs2856321	G	0.37	0.031	0.003	-0.013	0.042	0.753
Height	rs12228415	G	0.46	0.015	0.003	-0.004	0.044	0.927
Height	rs4326884	A	0.51	0.019	0.003	-0.011	0.041	0.789
Height	rs10770705	A	0.34	0.030	0.003	0.010	0.059	0.867
Height	rs11047239	G	0.30	0.023	0.003	0.010	0.040	0.803
Height	rs1861908	C	0.20	0.023	0.004	0.039	0.053	0.460
Height	rs10492364	T	0.26	0.017	0.004	0.001	0.155	0.995
Height	rs11049611	C	0.70	0.038	0.003	0.039	0.039	0.311
Height	rs12820411	G	0.68	0.021	0.003	-0.047	0.044	0.283
Height	rs10843390	T	0.29	0.021	0.003	-0.046	0.045	0.306
Height	rs10880969	C	0.70	0.024	0.003	-0.081	0.044	0.063
Height	rs2306694	G	0.10	0.046	0.006	0.058	0.087	0.503
Height	rs10877030	T	0.68	0.023	0.003	-0.067	0.043	0.119
Height	rs17122659	G	0.12	0.031	0.005	-0.021	0.062	0.733
Height	rs2164968	C	0.39	0.018	0.003	-0.013	0.040	0.746
Height	rs8756	C	0.50	0.059	0.003	-0.015	0.042	0.716
Height	rs10748128	T	0.35	0.038	0.003	-0.041	0.042	0.336
Height	rs17783015	C	0.85	0.023	0.004	0.030	0.055	0.590
Height	rs11107062	T	0.21	0.028	0.004	-0.018	0.050	0.716
Height	rs3825199	G	0.23	0.051	0.004	0.049	0.044	0.272
Height	rs10859567	T	0.56	0.035	0.003	-0.019	0.040	0.635
Height	rs7971536	T	0.54	0.029	0.003	0.039	0.037	0.289
Height	rs833706	A	0.75	0.021	0.004	0.049	0.051	0.335
Height	rs2164747	G	0.11	0.029	0.005	-0.052	0.064	0.415
Height	rs2888893	C	0.51	0.017	0.003	0.030	0.040	0.465
Height	rs11616067	A	0.76	0.021	0.004	-0.098	0.048	0.040
Height	rs4767473	A	0.86	0.025	0.004	0.001	0.056	0.986
Height	rs497273	C	0.38	0.018	0.003	0.068	0.043	0.116
Height	rs11835818	C	0.50	0.022	0.003	-0.033	0.040	0.419
Height	rs7980687	A	0.20	0.039	0.004	0.020	0.046	0.670
Height	rs11057552	A	0.18	0.028	0.004	-0.033	0.053	0.541
Height	rs1809889	T	0.29	0.032	0.003	-0.035	0.045	0.444
Height	rs1199734	G	0.81	0.022	0.004	-0.050	0.053	0.342
Height	rs11618507	T	0.25	0.023	0.004	0.030	0.057	0.605
Height	rs12323101	A	0.37	0.021	0.003	0.001	0.012	0.932
Height	rs12863103	C	0.72	0.019	0.003	0.049	0.041	0.228
Height	rs6561319	A	0.64	0.021	0.003	-0.034	0.042	0.419
Height	rs12871822	G	0.35	0.017	0.003	0.030	0.042	0.485
Height	rs7334755	C	0.82	0.032	0.004	0.001	0.011	0.929
Height	rs2687950	T	0.25	0.036	0.003	0.039	0.045	0.382
Height	rs1753637	T	0.31	0.036	0.003	0.068	0.045	0.129
Height	rs3118905	G	0.72	0.058	0.003	-0.013	0.043	0.762
Height	rs4883972	C	0.55	0.019	0.003	0.039	0.044	0.374
Height	rs3818416	C	0.78	0.021	0.004	0.020	0.039	0.610

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs11616380	T	0.28	0.019	0.003	-0.029	0.045	0.511
Height	rs6563199	T	0.35	0.018	0.003	0.010	0.029	0.729
Height	rs7319045	A	0.39	0.024	0.003	-0.113	0.042	0.007
Height	rs7985356	T	0.77	0.023	0.003	0.020	0.054	0.716
Height	rs17792664	G	0.15	0.032	0.004	0.030	0.062	0.635
Height	rs8017130	G	0.69	0.023	0.003	0.001	0.019	0.957
Height	rs1950500	T	0.30	0.031	0.003	-0.105	0.044	0.017
Height	rs12435366	C	0.74	0.023	0.004	-0.076	0.047	0.108
Height	rs10131337	T	0.24	0.027	0.004	0.148	0.048	0.002
Height	rs6571772	A	0.70	0.018	0.003	0.010	0.052	0.850
Height	rs4901537	G	0.26	0.022	0.004	0.001	0.014	0.944
Height	rs8006657	G	0.59	0.022	0.003	0.030	0.039	0.450
Height	rs11624136	A	0.50	0.018	0.003	0.039	0.037	0.295
Height	rs2093210	C	0.42	0.039	0.003	0.049	0.043	0.258
Height	rs2781373	G	0.63	0.021	0.003	0.010	0.038	0.793
Height	rs1980850	G	0.84	0.030	0.004	0.039	0.055	0.473
Height	rs2058092	T	0.56	0.017	0.003	0.030	0.045	0.513
Height	rs862034	G	0.64	0.028	0.003	-0.011	0.043	0.797
Height	rs10140101	T	0.44	0.014	0.003	0.049	0.041	0.238
Height	rs7154721	T	0.57	0.027	0.003	-0.074	0.041	0.069
Height	rs1190545	C	0.74	0.025	0.003	-0.003	0.040	0.940
Height	rs12882130	C	0.63	0.025	0.003	-0.061	0.042	0.148
Height	rs10152739	T	0.25	0.022	0.003	0.010	0.033	0.763
Height	rs316618	T	0.79	0.026	0.004	0.001	0.023	0.965
Height	rs1036477	A	0.90	0.032	0.005	-0.020	0.065	0.757
Height	rs10744956	G	0.79	0.028	0.004	-0.045	0.049	0.363
Height	rs16964211	G	0.95	0.057	0.007	0.049	0.099	0.623
Height	rs782930	G	0.65	0.020	0.003	-0.063	0.043	0.139
Height	rs7177711	A	0.54	0.021	0.003	-0.034	0.040	0.403
Height	rs7162825	T	0.50	0.016	0.003	-0.023	0.041	0.568
Height	rs17264185	G	0.27	0.020	0.003	0.010	0.031	0.750
Height	rs731874	A	0.28	0.018	0.003	-0.031	0.044	0.471
Height	rs10152591	A	0.90	0.044	0.005	-0.039	0.065	0.553
Height	rs975210	A	0.18	0.035	0.004	-0.025	0.052	0.623
Height	rs11634405	A	0.36	0.020	0.003	0.010	0.031	0.750
Height	rs12904334	A	0.02	0.084	0.013	0.077	0.160	0.630
Height	rs4337252	C	0.50	0.026	0.003	-0.010	0.039	0.794
Height	rs5742915	C	0.47	0.035	0.003	-0.044	0.040	0.274
Height	rs16968242	G	0.10	0.035	0.006	0.148	0.082	0.070
Height	rs12914466	A	0.62	0.017	0.003	-0.023	0.040	0.564
Height	rs17349981	A	0.85	0.025	0.004	0.010	0.081	0.902
Height	rs2257011	T	0.50	0.044	0.003	0.020	0.050	0.695
Height	rs7162542	G	0.56	0.046	0.003	0.039	0.038	0.296
Height	rs11855014	G	0.71	0.022	0.003	0.001	0.017	0.952

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs1348002	C	0.32	0.017	0.003	-0.003	0.037	0.935
Height	rs11633371	T	0.49	0.028	0.003	-0.025	0.040	0.529
Height	rs16942341	C	0.97	0.138	0.010	0.020	0.123	0.872
Height	rs2280470	A	0.33	0.044	0.003	0.010	0.065	0.879
Height	rs3817428	C	0.72	0.039	0.003	-0.011	0.047	0.812
Height	rs2238300	G	0.61	0.021	0.003	-0.050	0.041	0.221
Height	rs8028843	T	0.64	0.016	0.003	-0.024	0.041	0.550
Height	rs7181724	G	0.56	0.020	0.003	0.058	0.040	0.147
Height	rs2871865	C	0.88	0.062	0.005	0.095	0.065	0.143
Height	rs2573625	T	0.67	0.029	0.003	0.020	0.056	0.722
Height	rs4246302	G	0.32	0.027	0.003	-0.044	0.044	0.317
Height	rs4548838	T	0.46	0.033	0.003	-0.009	0.040	0.820
Height	rs7170986	G	0.76	0.019	0.003	-0.017	0.047	0.717
Height	rs8042424	C	0.75	0.023	0.004	0.030	0.054	0.584
Height	rs11648796	G	0.26	0.033	0.004	0.049	0.049	0.317
Height	rs12597498	T	0.37	0.018	0.003	0.122	0.041	0.003
Height	rs26868	A	0.47	0.029	0.003	-0.012	0.040	0.765
Height	rs2014467	C	0.34	0.019	0.003	0.010	0.047	0.833
Height	rs12926008	C	0.69	0.020	0.003	-0.059	0.043	0.174
Height	rs1053996	C	0.41	0.020	0.003	-0.013	0.042	0.755
Height	rs129963	C	0.59	0.021	0.003	-0.038	0.041	0.361
Height	rs2531992	A	0.85	0.027	0.004	-0.119	0.056	0.033
Height	rs960006	T	0.47	0.020	0.003	-0.028	0.041	0.486
Height	rs1659127	A	0.34	0.030	0.003	0.039	0.048	0.409
Height	rs2023693	G	0.60	0.017	0.003	0.010	0.027	0.716
Height	rs11642612	C	0.40	0.016	0.003	-0.063	0.041	0.123
Height	rs4785393	G	0.17	0.023	0.004	0.049	0.050	0.334
Height	rs9929889	C	0.60	0.017	0.003	-0.029	0.040	0.467
Height	rs8058684	A	0.30	0.021	0.003	0.049	0.046	0.287
Height	rs1966913	A	0.96	0.044	0.007	-0.052	0.098	0.595
Height	rs3790086	C	0.56	0.023	0.003	0.039	0.043	0.363
Height	rs217181	T	0.20	0.024	0.004	-0.047	0.050	0.349
Height	rs11640018	C	0.40	0.019	0.003	0.049	0.042	0.245
Height	rs4243206	A	0.19	0.024	0.004	0.049	0.054	0.362
Height	rs2326458	C	0.25	0.022	0.004	-0.012	0.045	0.787
Height	rs4843367	C	0.66	0.019	0.003	-0.056	0.043	0.196
Height	rs300039	C	0.78	0.020	0.004	0.058	0.052	0.264
Height	rs3748394	G	0.61	0.018	0.003	0.049	0.043	0.255
Height	rs8052560	A	0.79	0.036	0.004	0.039	0.043	0.359
Height	rs2377058	G	0.35	0.017	0.003	-0.134	0.042	0.001
Height	rs11861084	A	0.41	0.009	0.003	-0.002	0.043	0.963
Height	rs870183	G	0.54	0.017	0.003	0.020	0.041	0.630
Height	rs9217	C	0.37	0.028	0.003	-0.050	0.041	0.225
Height	rs8073177	C	0.78	0.019	0.004	-0.056	0.048	0.251

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs1625895	C	0.88	0.030	0.005	-0.058	0.060	0.338
Height	rs8067165	G	0.60	0.023	0.003	0.049	0.041	0.236
Height	rs8069300	G	0.47	0.016	0.003	0.039	0.042	0.354
Height	rs4640244	A	0.61	0.025	0.003	-0.014	0.041	0.732
Height	rs3809790	C	0.53	0.016	0.003	0.020	0.043	0.647
Height	rs9889755	T	0.11	0.003	0.005	-0.049	0.065	0.450
Height	rs3760318	G	0.63	0.041	0.003	0.020	0.042	0.640
Height	rs2028067	C	0.18	0.031	0.004	-0.109	0.055	0.048
Height	rs2338115	T	0.54	0.023	0.003	0.001	0.558	0.999
Height	rs584828	C	0.61	0.025	0.003	-0.065	0.041	0.113
Height	rs3169906	C	0.85	0.017	0.004	-0.028	0.055	0.605
Height	rs9766	A	0.54	0.021	0.003	-0.047	0.041	0.246
Height	rs4986172	C	0.66	0.034	0.003	0.020	0.055	0.718
Height	rs199515	C	0.80	0.016	0.004	0.140	0.047	0.003
Height	rs8073371	C	0.79	0.025	0.004	0.010	0.054	0.854
Height	rs6504389	C	0.16	0.017	0.004	-0.054	0.056	0.330
Height	rs318095	T	0.46	0.024	0.003	0.001	0.116	0.993
Height	rs2072153	C	0.31	0.026	0.003	-0.048	0.044	0.272
Height	rs4605213	C	0.34	0.018	0.003	0.030	0.048	0.540
Height	rs11867943	T	0.13	0.027	0.005	0.039	0.068	0.565
Height	rs227724	T	0.35	0.030	0.003	0.058	0.046	0.203
Height	rs1401795	A	0.51	0.030	0.003	0.001	0.017	0.953
Height	rs2079795	T	0.33	0.045	0.003	0.058	0.044	0.188
Height	rs2378870	T	0.37	0.020	0.003	-0.029	0.041	0.475
Height	rs2044124	T	0.06	0.045	0.007	-0.016	0.084	0.848
Height	rs2854207	G	0.28	0.046	0.003	-0.040	0.045	0.377
Height	rs2070776	G	0.66	0.042	0.003	-0.034	0.042	0.422
Height	rs3923086	C	0.60	0.024	0.003	0.020	0.036	0.579
Height	rs2072268	G	0.52	0.020	0.003	0.020	0.042	0.636
Height	rs11867479	T	0.35	0.026	0.003	-0.057	0.042	0.173
Height	rs10083886	T	0.26	0.019	0.003	0.030	0.046	0.525
Height	rs2117563	G	0.83	0.024	0.004	0.068	0.053	0.204
Height	rs1552173	C	0.46	0.018	0.003	0.058	0.044	0.182
Height	rs1478610	A	0.37	0.025	0.004	0.068	0.043	0.114
Height	rs4239020	C	0.33	0.021	0.003	-0.047	0.043	0.273
Height	rs888403	G	0.37	0.019	0.003	-0.068	0.042	0.103
Height	rs692964	G	0.40	0.019	0.003	-0.080	0.041	0.052
Height	rs14062	G	0.67	0.018	0.003	0.030	0.042	0.478
Height	rs4369779	C	0.80	0.056	0.004	-0.009	0.047	0.848
Height	rs11661645	A	0.31	0.020	0.003	0.058	0.042	0.164
Height	rs12454567	A	0.89	0.026	0.005	-0.086	0.066	0.195
Height	rs2337143	A	0.35	0.018	0.003	-0.100	0.043	0.019
Height	rs12458127	C	0.93	0.057	0.006	-0.041	0.091	0.653
Height	rs9967417	G	0.43	0.040	0.003	-0.017	0.040	0.669

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs11152213	C	0.25	0.025	0.004	-0.033	0.047	0.492
Height	rs8097893	A	0.95	0.042	0.007	-0.018	0.102	0.858
Height	rs11659752	T	0.70	0.024	0.003	-0.058	0.043	0.181
Height	rs11880992	A	0.40	0.033	0.003	0.058	0.040	0.148
Height	rs2074977	C	0.37	0.029	0.003	-0.004	0.043	0.925
Height	rs2123731	A	0.73	0.023	0.004	0.039	0.051	0.441
Height	rs891088	G	0.27	0.029	0.003	-0.009	0.046	0.844
Height	rs1346490	A	0.61	0.018	0.003	-0.042	0.042	0.314
Height	rs4072910	G	0.56	0.032	0.004	0.001	0.102	0.992
Height	rs6511689	T	0.69	0.018	0.003	0.039	0.048	0.417
Height	rs8102380	G	0.32	0.020	0.003	-0.028	0.042	0.503
Height	rs7259684	G	0.10	0.035	0.006	-0.017	0.076	0.821
Height	rs8103068	T	0.86	0.031	0.005	-0.025	0.061	0.677
Height	rs10401193	A	0.82	0.028	0.004	-0.015	0.054	0.779
Height	rs8103992	A	0.20	0.029	0.004	-0.029	0.050	0.553
Height	rs7253628	G	0.17	0.024	0.004	0.095	0.052	0.069
Height	rs4802134	A	0.21	0.027	0.004	-0.017	0.046	0.707
Height	rs4803468	A	0.42	0.030	0.003	-0.016	0.041	0.694
Height	rs11880124	A	0.91	0.041	0.005	-0.052	0.071	0.464
Height	rs2682587	A	0.20	0.023	0.004	-0.010	0.050	0.841
Height	rs2059877	T	0.26	0.019	0.003	-0.027	0.046	0.549
Height	rs7273787	G	0.35	0.022	0.003	-0.022	0.042	0.593
Height	rs17721822	G	0.63	0.035	0.003	-0.044	0.042	0.293
Height	rs1884897	A	0.36	0.044	0.003	0.049	0.039	0.212
Height	rs6085662	C	0.35	0.020	0.003	0.077	0.041	0.063
Height	rs6080830	A	0.56	0.016	0.003	0.010	0.071	0.888
Height	rs7261425	C	0.71	0.021	0.003	-0.020	0.045	0.652
Height	rs8117259	C	0.83	0.023	0.004	-0.027	0.053	0.602
Height	rs6137287	T	0.31	0.020	0.003	-0.013	0.045	0.770
Height	rs1074683	C	0.76	0.044	0.003	-0.022	0.046	0.630
Height	rs1535466	G	0.27	0.027	0.003	0.020	0.036	0.579
Height	rs143384	G	0.43	0.075	0.003	-0.031	0.041	0.446
Height	rs2425163	G	0.18	0.058	0.004	0.049	0.053	0.354
Height	rs4812586	A	0.84	0.030	0.004	-0.100	0.056	0.077
Height	rs2224538	T	0.65	0.017	0.003	0.030	0.039	0.452
Height	rs17450430	T	0.24	0.035	0.003	0.068	0.046	0.145
Height	rs6020202	G	0.78	0.022	0.004	0.039	0.048	0.413
Height	rs1326023	A	0.30	0.024	0.003	-0.037	0.044	0.401
Height	rs2057291	A	0.34	0.020	0.003	-0.014	0.042	0.735
Height	rs3026499	G	0.67	0.026	0.005	0.039	0.048	0.411
Height	rs6061231	C	0.73	0.021	0.003	0.001	0.154	0.995
Height	rs2829941	T	0.61	0.017	0.003	0.020	0.054	0.714
Height	rs2834442	A	0.64	0.024	0.003	0.020	0.055	0.721
Height	rs2211866	A	0.41	0.022	0.003	0.020	0.036	0.587

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Height	rs9977276	G	0.78	0.022	0.004	0.030	0.047	0.525
Height	rs7284476	A	0.43	0.018	0.003	0.020	0.042	0.635
Height	rs5757318	T	0.15	0.029	0.005	-0.040	0.056	0.478
Height	rs738288	G	0.47	0.020	0.003	0.001	0.037	0.979
Height	rs11090631	T	0.20	0.021	0.004	0.058	0.049	0.231
WHRadjBMI	rs905938	T	0.74	0.025	0.004	0.020	0.037	0.596
WHRadjBMI	rs10919388	C	0.72	0.024	0.004	0.030	0.051	0.562
WHRadjBMI	rs1385167	G	0.15	0.029	0.004	0.030	0.057	0.604
WHRadjBMI	rs1569135	A	0.53	0.021	0.003	0.020	0.048	0.681
WHRadjBMI	rs10804591	A	0.79	0.025	0.004	-0.027	0.048	0.568
WHRadjBMI	rs17451107	T	0.61	0.026	0.004	0.058	0.044	0.184
WHRadjBMI	rs3805389	A	0.28	0.012	0.005	-0.011	0.044	0.803
WHRadjBMI	rs9991328	T	0.49	0.019	0.003	-0.048	0.041	0.235
WHRadjBMI	rs303084	A	0.80	0.023	0.004	-0.029	0.049	0.549
WHRadjBMI	rs9687846	A	0.19	0.024	0.004	0.077	0.052	0.136
WHRadjBMI	rs6556301	T	0.36	0.022	0.004	0.039	0.047	0.407
WHRadjBMI	rs7759742	A	0.51	0.023	0.004	-0.058	0.040	0.149
WHRadjBMI	rs1776897	G	0.08	0.030	0.004	-0.019	0.071	0.786
WHRadjBMI	rs7801581	T	0.24	0.027	0.004	-0.004	0.051	0.937
WHRadjBMI	rs7830933	A	0.77	0.022	0.003	0.020	0.039	0.612
WHRadjBMI	rs12679556	G	0.25	0.027	0.004	0.030	0.048	0.539
WHRadjBMI	rs10991437	A	0.11	0.031	0.004	0.049	0.066	0.458
WHRadjBMI	rs7917772	A	0.62	0.014	0.004	-0.024	0.042	0.559
WHRadjBMI	rs11231693	A	0.06	0.041	0.004	0.010	0.083	0.905
WHRadjBMI	rs4765219	C	0.67	0.028	0.003	0.020	0.055	0.720
WHRadjBMI	rs8030605	A	0.14	0.030	0.004	-0.009	0.062	0.884
WHRadjBMI	rs1440372	C	0.71	0.024	0.004	0.010	0.047	0.834
WHRadjBMI	rs2925979	T	0.31	0.018	0.005	-0.049	0.044	0.258
WHRadjBMI	rs4646404	G	0.67	0.027	0.008	-0.018	0.043	0.673
WHRadjBMI	rs8066985	A	0.50	0.018	0.004	-0.045	0.040	0.263
WHRadjBMI	rs12454712	T	0.61	0.016	0.004	-0.058	0.041	0.160
WHRadjBMI	rs12608504	A	0.36	0.022	0.004	-0.057	0.041	0.170
WHRadjBMI	rs4081724	G	0.85	0.035	0.004	0.039	0.058	0.495
WHRadjBMI	rs979012	T	0.34	0.027	0.005	0.068	0.044	0.120
WHRadjBMI	rs224333	G	0.62	0.020	0.004	0.049	0.040	0.224
WHRadjBMI	rs6090583	A	0.48	0.022	0.004	-0.031	0.041	0.441
WHRadjBMI	rs1534696	C	0.43	0.011	0.004	0.077	0.042	0.070
WHRadjBMI	rs2645294	T	0.58	0.031	0.005	-0.056	0.040	0.167
WHRadjBMI	rs714515	G	0.43	0.027	0.004	-0.021	0.041	0.603
WHRadjBMI	rs2820443	T	0.72	0.035	0.003	0.020	0.039	0.613
WHRadjBMI	rs10195252	T	0.59	0.027	0.004	-0.011	0.040	0.781
WHRadjBMI	rs17819328	G	0.43	0.021	0.004	0.001	0.009	0.913
WHRadjBMI	rs2276824	C	0.43	0.024	0.005	-0.031	0.040	0.428
WHRadjBMI	rs2371767	G	0.72	0.036	0.003	-0.057	0.045	0.211

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
WHRadjBMI	rs1045241	C	0.71	0.019	0.004	0.001	0.030	0.973
WHRadjBMI	rs7705502	A	0.33	0.027	0.004	-0.038	0.044	0.388
WHRadjBMI	rs1294410	C	0.63	0.031	0.004	0.058	0.042	0.167
WHRadjBMI	rs1358980	T	0.47	0.039	0.004	-0.052	0.041	0.198
WHRadjBMI	rs1936805	T	0.51	0.043	0.004	-0.024	0.040	0.540
WHRadjBMI	rs10245353	A	0.20	0.035	0.004	-0.063	0.051	0.220
WHRadjBMI	rs10842707	T	0.23	0.032	0.003	0.039	0.055	0.477
WHRadjBMI	rs1443512	A	0.24	0.028	0.004	0.049	0.053	0.359
WHRadjBMI	rs2294239	A	0.59	0.025	0.004	0.039	0.037	0.287
Body fat	rs1558902	A	0.42	0.051	0.005	0.010	0.031	0.751
Body fat	rs2943652	C	0.36	0.034	0.005	0.020	0.042	0.640
Body fat	rs6567160	C	0.24	0.034	0.005	-0.034	0.047	0.474
Body fat	rs6755502	C	0.83	0.039	0.006	0.068	0.057	0.232
Body fat	rs6738627	A	0.37	0.030	0.005	0.001	0.026	0.970
Body fat	rs693839	C	0.32	0.028	0.005	-0.039	0.044	0.379
Body fat	rs6857	C	0.83	0.048	0.008	0.010	0.049	0.838
Body fat	rs4788099	G	0.38	0.027	0.005	0.001	0.013	0.939
Body fat	rs9906944	C	0.67	0.033	0.006	0.039	0.048	0.413
Body fat	rs543874	G	0.19	0.032	0.006	-0.062	0.050	0.215
Body fat	rs3761445	G	0.41	0.024	0.005	-0.027	0.041	0.503
Body fat	rs757318	C	0.50	0.024	0.005	-0.011	0.040	0.783
Infant head circumference	rs7980687	A	0.20	0.050	0.012	0.020	0.046	0.670
Infant head circumference	rs1042725	T	NA	0.031	0.010	0.020	0.037	0.595
Bone mineral density	rs479336	G	0.26	0.040	0.005	0.039	0.052	0.453
Bone mineral density	rs7584262	T	0.23	0.040	0.007	0.020	0.039	0.613
Bone mineral density	rs17040773	A	0.76	0.040	0.007	0.039	0.046	0.392
Bone mineral density	rs1026364	T	0.37	0.030	0.005	-0.054	0.042	0.193
Bone mineral density	rs3755955	G	0.84	0.060	0.008	0.001	0.261	0.997
Bone mineral density	rs9466056	G	0.62	0.040	0.005	-0.079	0.041	0.054
Bone mineral density	rs3801387	G	0.26	0.080	0.006	-0.036	0.045	0.427
Bone mineral density	rs7812088	A	0.13	0.050	0.009	0.058	0.063	0.352
Bone mineral density	rs7851693	G	0.35	0.050	0.005	-0.011	0.043	0.797
Bone mineral density	rs1373004	G	0.87	0.040	0.007	-0.021	0.065	0.743
Bone mineral density	rs7084921	T	0.39	0.030	0.005	0.020	0.042	0.640
Bone mineral density	rs7953528	A	0.18	0.050	0.007	-0.020	0.053	0.701
Bone mineral density	rs2887571	G	0.24	0.030	0.005	0.010	0.092	0.914
Bone mineral density	rs1053051	C	0.48	0.030	0.005	0.039	0.037	0.293
Bone mineral density	rs1286083	T	0.82	0.050	0.006	0.068	0.055	0.219
Bone mineral density	rs4985155	G	0.33	0.030	0.005	0.001	0.086	0.991
Bone mineral density	rs9921222	C	0.52	0.040	0.006	-0.070	0.040	0.078
Bone mineral density	rs13336428	G	0.57	0.040	0.005	-0.047	0.041	0.254
Bone mineral density	rs4790881	A	0.69	0.050	0.006	-0.014	0.044	0.746
Bone mineral density	rs7217932	A	0.46	0.030	0.004	-0.056	0.040	0.163
Bone mineral density	rs4796995	A	0.63	0.030	0.005	-0.054	0.042	0.193

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Bone mineral density	rs17482952	A	0.93	0.080	0.012	-0.208	0.076	0.006
Bone mineral density	rs12407028	T	0.60	0.050	0.005	-0.065	0.041	0.113
Bone mineral density	rs7521902	C	0.69	0.040	0.007	0.049	0.049	0.316
Bone mineral density	rs6426749	C	0.17	0.110	0.007	-0.091	0.052	0.083
Bone mineral density	rs1346004	G	0.50	0.050	0.005	0.001	0.096	0.992
Bone mineral density	rs430727	T	0.45	0.060	0.006	-0.042	0.040	0.300
Bone mineral density	rs6532023	T	0.34	0.060	0.006	-0.124	0.042	0.003
Bone mineral density	rs1366594	A	0.54	0.080	0.005	-0.011	0.039	0.777
Bone mineral density	rs13204965	A	0.76	0.040	0.006	-0.045	0.046	0.329
Bone mineral density	rs7751941	G	0.79	0.040	0.007	0.039	0.053	0.463
Bone mineral density	rs4869742	C	0.69	0.050	0.006	0.010	0.034	0.768
Bone mineral density	rs6959212	T	0.34	0.040	0.005	-0.042	0.043	0.325
Bone mineral density	rs4727338	C	0.67	0.080	0.005	0.049	0.045	0.279
Bone mineral density	rs2062377	T	0.43	0.060	0.006	-0.043	0.041	0.294
Bone mineral density	rs7932354	T	0.31	0.050	0.006	0.010	0.036	0.783
Bone mineral density	rs163879	C	0.32	0.030	0.005	-0.006	0.046	0.896
Bone mineral density	rs7108738	G	0.17	0.080	0.007	-0.052	0.053	0.326
Bone mineral density	rs3736228	T	0.15	0.050	0.008	-0.030	0.056	0.586
Bone mineral density	rs736825	C	0.56	0.040	0.007	0.010	0.047	0.834
Bone mineral density	rs2016266	G	0.32	0.030	0.005	-0.045	0.043	0.294
Bone mineral density	rs9533090	C	0.51	0.050	0.005	0.049	0.042	0.248
Bone mineral density	rs11623869	G	0.65	0.040	0.005	0.010	0.062	0.873
Bone mineral density	rs10048146	A	0.80	0.050	0.006	-0.004	0.050	0.936
Bone mineral density	rs4792909	T	0.37	0.040	0.006	0.068	0.043	0.116
Bone mineral density	rs227584	C	0.30	0.060	0.006	0.095	0.044	0.030
Bone mineral density	rs884205	C	0.73	0.040	0.006	0.010	0.033	0.766
Bone mineral density	rs3790160	T	0.50	0.040	0.006	-0.040	0.040	0.324
HDL	rs12145743	G	NA	0.020	0.002	-0.065	0.043	0.126
HDL	rs12748152	C	NA	0.051	0.009	0.020	0.073	0.787
HDL	rs1689800	A	NA	0.034	0.003	-0.016	0.041	0.693
HDL	rs4650994	G	NA	0.021	0.004	-0.001	0.036	0.978
HDL	rs4660293	A	NA	0.035	0.005	-0.043	0.047	0.363
HDL	rs4846914	A	NA	0.048	0.005	0.030	0.041	0.470
HDL	rs1047891	A	NA	0.027	0.003	0.010	0.036	0.785
HDL	rs12328675	C	NA	0.045	0.002	0.010	0.054	0.853
HDL	rs2972146	G	NA	0.032	0.005	0.010	0.030	0.739
HDL	rs13326165	A	NA	0.029	0.005	-0.025	0.050	0.614
HDL	rs17404153	G	NA	0.028	0.005	-0.007	0.058	0.904
HDL	rs2013208	T	NA	0.025	0.004	-0.003	0.037	0.936
HDL	rs2290547	G	NA	0.030	0.005	0.020	0.061	0.744
HDL	rs2606736	C	NA	0.025	0.003	0.039	0.040	0.331
HDL	rs6805251	T	NA	0.020	0.003	0.140	0.043	0.001
HDL	rs10019888	A	NA	0.027	0.004	0.095	0.055	0.084
HDL	rs13107325	C	0.93	0.071	0.012	0.086	0.073	0.236

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentaenoic acid; DHA = Docosahexaenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).



**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
HDL	rs2602836	A	NA	0.019	0.003	0.010	0.032	0.757
HDL	rs3822072	A	0.48	0.025	0.004	0.049	0.042	0.245
HDL	rs6450176	G	NA	0.025	0.005	0.010	0.067	0.882
HDL	rs1936800	T	0.50	0.020	0.004	-0.026	0.040	0.512
HDL	rs605066	T	NA	0.028	0.005	0.020	0.046	0.666
HDL	rs998584	C	NA	0.026	0.005	-0.069	0.040	0.085
HDL	rs17145738	C	NA	0.041	0.007	-0.015	0.060	0.802
HDL	rs17173637	T	NA	0.036	0.004	0.039	0.073	0.590
HDL	rs4142995	G	NA	0.026	0.003	-0.036	0.041	0.382
HDL	rs4731702	T	NA	0.029	0.005	-0.011	0.039	0.779
HDL	rs4917014	G	NA	0.022	0.003	-0.033	0.043	0.447
HDL	rs702485	G	NA	0.024	0.004	0.020	0.052	0.704
HDL	rs12678919	G	NA	0.155	0.027	0.140	0.067	0.037
HDL	rs2293889	G	NA	0.031	0.005	0.010	0.034	0.771
HDL	rs2954029	A	0.55	0.040	0.009	-0.081	0.040	0.044
HDL	rs4841132	G	NA	0.082	0.014	0.020	0.069	0.774
HDL	rs1883025	C	NA	0.070	0.013	-0.023	0.045	0.608
HDL	rs581080	C	NA	0.042	0.008	-0.028	0.052	0.585
HDL	rs970548	C	NA	0.026	0.004	0.010	0.064	0.877
HDL	rs11246602	C	NA	0.034	0.005	0.086	0.056	0.124
HDL	rs12801636	A	NA	0.024	0.004	-0.014	0.048	0.767
HDL	rs174546	C	NA	0.039	0.007	0.020	0.053	0.708
HDL	rs2923084	A	NA	0.026	0.005	-0.023	0.051	0.650
HDL	rs3136441	C	NA	0.054	0.010	0.086	0.056	0.123
HDL	rs499974	C	NA	0.026	0.003	-0.027	0.054	0.614
HDL	rs6589939	G	NA	0.022	0.004	-0.009	0.039	0.819
HDL	rs964184	G	0.15	0.106	0.015	-0.007	0.060	0.907
HDL	rs11613352	T	NA	0.028	0.005	0.030	0.042	0.476
HDL	rs4759375	T	NA	0.056	0.009	0.030	0.086	0.731
HDL	rs4765127	G	NA	0.032	0.004	-0.026	0.042	0.535
HDL	rs7134375	A	NA	0.021	0.003	-0.065	0.040	0.105
HDL	rs7134594	T	NA	0.035	0.004	-0.008	0.042	0.850
HDL	rs838880	C	NA	0.048	0.007	0.030	0.049	0.544
HDL	rs4983559	G	NA	0.020	0.002	-0.010	0.043	0.815
HDL	rs1532085	A	NA	0.107	0.013	0.113	0.041	0.006
HDL	rs2652834	G	NA	0.028	0.004	-0.029	0.051	0.567
HDL	rs1121980	G	NA	0.020	0.003	-0.006	0.039	0.878
HDL	rs16942887	A	NA	0.083	0.013	0.039	0.058	0.495
HDL	rs2925979	T	0.31	0.035	0.005	-0.049	0.044	0.258
HDL	rs3764261	A	NA	0.241	0.020	0.030	0.040	0.465
HDL	rs11869286	C	NA	0.032	0.003	-0.030	0.043	0.474
HDL	rs4129767	A	NA	0.024	0.002	0.039	0.042	0.354
HDL	rs4148008	C	NA	0.028	0.004	-0.003	0.044	0.945
HDL	rs12967135	G	NA	0.026	0.003	-0.033	0.047	0.486

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
HDL	rs7241918	T	NA	0.090	0.014	-0.010	0.056	0.857
HDL	rs17695224	G	NA	0.029	0.005	0.030	0.040	0.464
HDL	rs386000	C	NA	0.048	0.005	-0.050	0.048	0.293
HDL	rs6857	C	0.83	0.067	0.013	0.010	0.049	0.838
HDL	rs7255436	A	NA	0.032	0.005	-0.035	0.041	0.395
HDL	rs731839	G	0.34	0.022	0.003	0.049	0.043	0.258
HDL	rs737337	T	NA	0.056	0.010	-0.089	0.075	0.237
HDL	rs1800961	C	NA	0.127	0.023	0.010	0.100	0.921
HDL	rs6065906	T	NA	0.059	0.010	-0.037	0.051	0.473
HDL	rs181360	T	NA	0.038	0.007	0.095	0.052	0.068
LDL	rs12027135	T	NA	0.030	0.005	0.077	0.038	0.044
LDL	rs12748152	C	NA	0.050	0.009	0.020	0.073	0.787
LDL	rs2131925	T	NA	0.049	0.009	0.049	0.044	0.270
LDL	rs2479409	G	NA	0.064	0.012	0.086	0.041	0.035
LDL	rs2642442	T	NA	0.036	0.006	0.010	0.029	0.734
LDL	rs267733	A	NA	0.033	0.005	0.020	0.045	0.661
LDL	rs514230	T	NA	0.036	0.006	0.049	0.044	0.266
LDL	rs629301	T	NA	0.167	0.026	0.039	0.048	0.410
LDL	rs10490626	G	NA	0.051	0.009	0.077	0.073	0.292
LDL	rs11563251	T	NA	0.034	0.005	-0.051	0.064	0.426
LDL	rs1250229	C	NA	0.024	0.004	-0.062	0.046	0.179
LDL	rs1367117	A	NA	0.119	0.021	-0.021	0.043	0.622
LDL	rs2030746	T	NA	0.021	0.004	0.049	0.042	0.246
LDL	rs2710642	A	NA	0.024	0.004	0.058	0.042	0.166
LDL	rs4299376	G	NA	0.081	0.012	0.058	0.045	0.197
LDL	rs17404153	G	NA	0.034	0.006	-0.007	0.058	0.904
LDL	rs7640978	C	NA	0.039	0.007	-0.034	0.070	0.633
LDL	rs6831256	G	NA	0.022	0.004	0.039	0.040	0.327
LDL	rs12916	C	NA	0.073	0.013	-0.036	0.041	0.385
LDL	rs4530754	A	NA	0.028	0.004	-0.037	0.040	0.356
LDL	rs6882076	C	NA	0.046	0.008	0.001	0.012	0.931
LDL	rs1564348	C	NA	0.048	0.008	0.010	0.083	0.904
LDL	rs1800562	G	0.94	0.062	0.010	0.039	0.068	0.561
LDL	rs3757354	C	NA	0.038	0.007	0.049	0.046	0.285
LDL	rs9488822	T	NA	0.031	0.005	-0.011	0.041	0.787
LDL	rs12670798	C	NA	0.034	0.006	-0.026	0.046	0.569
LDL	rs2072183	C	NA	0.039	0.007	-0.049	0.049	0.310
LDL	rs4722551	C	NA	0.039	0.007	0.001	0.017	0.953
LDL	rs10102164	A	NA	0.032	0.007	0.020	0.040	0.622
LDL	rs11136341	G	NA	0.045	0.008	0.058	0.038	0.128
LDL	rs2081687	T	NA	0.031	0.006	-0.070	0.042	0.096
LDL	rs2954029	A	0.55	0.056	0.010	-0.081	0.040	0.044
LDL	rs4841132	G	NA	0.067	0.012	0.020	0.069	0.774
LDL	rs3780181	A	NA	0.044	0.008	-0.179	0.080	0.025

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
LDL	rs635634	T	0.19	0.077	0.011	0.020	0.047	0.672
LDL	rs2255141	A	NA	0.030	0.005	0.058	0.046	0.204
LDL	rs11220462	A	NA	0.059	0.010	-0.017	0.058	0.768
LDL	rs174546	C	NA	0.051	0.009	0.020	0.053	0.708
LDL	rs964184	G	0.15	0.086	0.015	-0.007	0.060	0.907
LDL	rs11065987	A	NA	0.027	0.004	-0.053	0.041	0.188
LDL	rs1169288	C	NA	0.038	0.006	0.020	0.048	0.678
LDL	rs4942486	T	NA	0.024	0.004	-0.003	0.047	0.949
LDL	rs8017377	A	NA	0.030	0.004	0.104	0.041	0.010
LDL	rs2000999	A	NA	0.065	0.010	-0.021	0.052	0.681
LDL	rs3764261	A	NA	0.053	0.009	0.030	0.040	0.465
LDL	rs1801689	C	NA	0.103	0.018	-0.042	0.117	0.721
LDL	rs314253	T	NA	0.024	0.004	0.010	0.057	0.862
LDL	rs7206971	A	NA	0.029	0.004	-0.081	0.040	0.043
LDL	rs10401969	C	0.08	0.118	0.020	0.104	0.076	0.169
LDL	rs6511720	G	NA	0.221	0.036	-0.084	0.062	0.175
LDL	rs6857	C	0.83	0.192	0.028	0.010	0.049	0.838
LDL	rs2328223	C	NA	0.030	0.006	0.010	0.039	0.799
LDL	rs2902940	A	NA	0.027	0.004	-0.058	0.043	0.181
LDL	rs364585	G	NA	0.025	0.004	-0.008	0.044	0.854
LDL	rs6029526	A	NA	0.044	0.006	-0.008	0.042	0.850
LDL	rs4253772	T	NA	0.031	0.004	-0.022	0.065	0.730
LDL	rs5763662	T	NA	0.077	0.012	0.157	0.132	0.235
Total cholesterol	rs1077514	T	NA	0.030	0.003	0.010	0.047	0.834
Total cholesterol	rs12027135	T	NA	0.027	0.002	0.077	0.038	0.044
Total cholesterol	rs2131925	T	NA	0.075	0.008	0.049	0.044	0.270
Total cholesterol	rs2479409	G	NA	0.054	0.005	0.086	0.041	0.035
Total cholesterol	rs2642442	T	NA	0.035	0.003	0.010	0.029	0.734
Total cholesterol	rs514230	T	NA	0.039	0.004	0.049	0.044	0.266
Total cholesterol	rs629301	T	NA	0.134	0.013	0.039	0.048	0.410
Total cholesterol	rs7515577	A	NA	0.037	0.003	0.001	0.021	0.961
Total cholesterol	rs10490626	G	NA	0.042	0.004	0.077	0.073	0.292
Total cholesterol	rs11563251	T	NA	0.037	0.005	-0.051	0.064	0.426
Total cholesterol	rs11694172	G	NA	0.028	0.003	0.058	0.048	0.226
Total cholesterol	rs1260326	C	0.59	0.051	0.005	0.068	0.042	0.106
Total cholesterol	rs1367117	A	NA	0.100	0.013	-0.021	0.043	0.622
Total cholesterol	rs2030746	T	NA	0.020	0.002	0.049	0.042	0.246
Total cholesterol	rs2287623	G	NA	0.027	0.003	0.049	0.044	0.268
Total cholesterol	rs4299376	G	NA	0.079	0.008	0.058	0.045	0.197
Total cholesterol	rs7570971	A	NA	0.030	0.003	0.039	0.047	0.404
Total cholesterol	rs13315871	G	NA	0.036	0.004	0.104	0.073	0.153
Total cholesterol	rs2290159	G	NA	0.037	0.004	0.001	4.984	1.000
Total cholesterol	rs7640978	C	NA	0.038	0.003	-0.034	0.070	0.633
Total cholesterol	rs6831256	G	NA	0.025	0.002	0.039	0.040	0.327

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentaenoic acid; DHA = Docosahexaenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Total cholesterol	rs12916	C	NA	0.068	0.006	-0.036	0.041	0.385
Total cholesterol	rs4530754	A	NA	0.023	0.002	-0.037	0.040	0.356
Total cholesterol	rs6882076	C	NA	0.051	0.005	0.001	0.012	0.931
Total cholesterol	rs1564348	C	NA	0.049	0.004	0.010	0.083	0.904
Total cholesterol	rs1800562	G	0.94	0.056	0.007	0.039	0.068	0.561
Total cholesterol	rs2758886	A	NA	0.023	0.002	-0.028	0.044	0.521
Total cholesterol	rs2814982	C	NA	0.044	0.004	0.001	0.220	0.996
Total cholesterol	rs3757354	C	NA	0.035	0.003	0.049	0.046	0.285
Total cholesterol	rs9376090	T	NA	0.025	0.003	0.058	0.049	0.238
Total cholesterol	rs9488822	T	NA	0.034	0.003	-0.011	0.041	0.787
Total cholesterol	rs12670798	C	NA	0.036	0.003	-0.026	0.046	0.569
Total cholesterol	rs1997243	G	NA	0.033	0.003	-0.015	0.058	0.795
Total cholesterol	rs2072183	C	NA	0.036	0.004	-0.049	0.049	0.310
Total cholesterol	rs4722551	C	NA	0.029	0.003	0.001	0.017	0.953
Total cholesterol	rs10102164	A	NA	0.030	0.003	0.020	0.040	0.622
Total cholesterol	rs11136341	G	NA	0.038	0.004	0.058	0.038	0.128
Total cholesterol	rs1495741	G	NA	0.032	0.003	-0.067	0.048	0.163
Total cholesterol	rs2081687	T	NA	0.038	0.004	-0.070	0.042	0.096
Total cholesterol	rs2954029	A	0.55	0.062	0.011	-0.081	0.040	0.044
Total cholesterol	rs4841132	G	NA	0.078	0.012	0.020	0.069	0.774
Total cholesterol	rs1883025	C	NA	0.067	0.012	-0.023	0.045	0.608
Total cholesterol	rs3780181	A	NA	0.044	0.005	-0.179	0.080	0.025
Total cholesterol	rs581080	C	NA	0.038	0.004	-0.028	0.052	0.585
Total cholesterol	rs635634	T	0.19	0.069	0.008	0.020	0.047	0.672
Total cholesterol	rs10904908	G	NA	0.025	0.003	-0.053	0.041	0.190
Total cholesterol	rs2255141	A	NA	0.031	0.004	0.058	0.046	0.204
Total cholesterol	rs970548	C	NA	0.025	0.003	0.010	0.064	0.877
Total cholesterol	rs10128711	C	NA	0.031	0.004	-0.004	0.047	0.933
Total cholesterol	rs11220462	A	NA	0.047	0.007	-0.017	0.058	0.768
Total cholesterol	rs11603023	T	NA	0.022	0.003	-0.030	0.041	0.457
Total cholesterol	rs174546	C	NA	0.048	0.007	0.020	0.053	0.708
Total cholesterol	rs6589939	G	NA	0.031	0.004	-0.009	0.039	0.819
Total cholesterol	rs964184	G	0.15	0.121	0.015	-0.007	0.060	0.907
Total cholesterol	rs11065987	A	NA	0.031	0.004	-0.053	0.041	0.188
Total cholesterol	rs1169288	C	NA	0.032	0.004	0.020	0.048	0.678
Total cholesterol	rs4883201	A	NA	0.035	0.004	0.122	0.065	0.059
Total cholesterol	rs1532085	A	NA	0.054	0.008	0.113	0.041	0.006
Total cholesterol	rs2000999	A	NA	0.062	0.008	-0.021	0.052	0.681
Total cholesterol	rs3764261	A	NA	0.050	0.005	0.030	0.040	0.465
Total cholesterol	rs314253	T	NA	0.023	0.003	0.010	0.057	0.862
Total cholesterol	rs7206971	A	NA	0.030	0.004	-0.081	0.040	0.043
Total cholesterol	rs7241918	T	NA	0.058	0.007	-0.010	0.056	0.857
Total cholesterol	rs10401969	C	0.08	0.137	0.015	0.104	0.076	0.169
Total cholesterol	rs492602	G	0.56	0.031	0.005	-0.024	0.040	0.545

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Total cholesterol	rs6511720	G	NA	0.185	0.031	-0.084	0.062	0.175
Total cholesterol	rs6857	C	0.83	0.164	0.019	0.010	0.049	0.838
Total cholesterol	rs1800961	C	NA	0.106	0.016	0.010	0.100	0.921
Total cholesterol	rs2277862	C	NA	0.035	0.005	-0.023	0.058	0.688
Total cholesterol	rs2902940	A	NA	0.024	0.004	-0.058	0.043	0.181
Total cholesterol	rs6029526	A	NA	0.040	0.005	-0.008	0.042	0.850
Total cholesterol	rs138777	A	NA	0.021	0.002	0.058	0.046	0.203
Total cholesterol	rs4253772	T	NA	0.032	0.004	-0.022	0.065	0.730
Triglycerides	rs12748152	C	NA	0.037	0.003	0.020	0.073	0.787
Triglycerides	rs2131925	T	NA	0.066	0.007	0.049	0.044	0.270
Triglycerides	rs4846914	A	NA	0.040	0.004	0.030	0.041	0.470
Triglycerides	rs1260326	C	0.59	0.115	0.011	0.068	0.042	0.106
Triglycerides	rs2972146	G	NA	0.028	0.003	0.010	0.030	0.739
Triglycerides	rs442177	T	NA	0.031	0.003	-0.075	0.041	0.066
Triglycerides	rs6831256	G	NA	0.026	0.002	0.039	0.040	0.327
Triglycerides	rs6882076	C	NA	0.029	0.003	0.001	0.012	0.931
Triglycerides	rs9686661	T	NA	0.038	0.004	-0.077	0.050	0.123
Triglycerides	rs1936800	T	0.50	0.020	0.002	-0.026	0.040	0.512
Triglycerides	rs998584	C	NA	0.029	0.003	-0.069	0.040	0.085
Triglycerides	rs13238203	C	NA	0.059	0.006	-0.060	0.119	0.615
Triglycerides	rs17145738	C	NA	0.115	0.012	-0.015	0.060	0.802
Triglycerides	rs38855	A	NA	0.019	0.002	0.001	0.155	0.995
Triglycerides	rs4722551	C	NA	0.023	0.002	0.001	0.017	0.953
Triglycerides	rs11776767	C	NA	0.022	0.002	-0.015	0.041	0.710
Triglycerides	rs12678919	G	NA	0.170	0.016	0.140	0.067	0.037
Triglycerides	rs1495741	G	NA	0.040	0.005	-0.067	0.048	0.163
Triglycerides	rs2954029	A	0.55	0.076	0.007	-0.081	0.040	0.044
Triglycerides	rs10761731	A	NA	0.031	0.003	-0.006	0.038	0.874
Triglycerides	rs1832007	A	NA	0.033	0.003	-0.021	0.056	0.704
Triglycerides	rs2068888	G	NA	0.024	0.002	-0.023	0.040	0.560
Triglycerides	rs174546	C	NA	0.045	0.004	0.020	0.053	0.708
Triglycerides	rs964184	G	0.15	0.234	0.020	-0.007	0.060	0.907
Triglycerides	rs11613352	T	NA	0.028	0.002	0.030	0.042	0.476
Triglycerides	rs4765127	G	NA	0.029	0.003	-0.026	0.042	0.535
Triglycerides	rs1532085	A	NA	0.031	0.003	0.113	0.041	0.006
Triglycerides	rs2412710	A	NA	0.099	0.010	0.122	0.147	0.405
Triglycerides	rs2929282	T	NA	0.072	0.007	0.223	0.098	0.023
Triglycerides	rs1121980	G	NA	0.021	0.002	-0.006	0.039	0.878
Triglycerides	rs11649653	C	NA	0.027	0.003	-0.143	0.041	0.001
Triglycerides	rs3198697	C	NA	0.020	0.002	0.010	0.079	0.900
Triglycerides	rs3764261	A	NA	0.040	0.005	0.030	0.040	0.465
Triglycerides	rs8077889	C	NA	0.025	0.003	0.049	0.046	0.292
Triglycerides	rs10401969	C	0.08	0.121	0.012	0.104	0.076	0.169
Triglycerides	rs7248104	G	NA	0.022	0.003	-0.006	0.042	0.886

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
Triglycerides	rs731839	G	0.34	0.022	0.002	0.049	0.043	0.258
Triglycerides	rs6065906	T	NA	0.053	0.006	-0.037	0.051	0.473
Triglycerides	rs5756931	T	NA	0.020	0.002	0.049	0.039	0.209
Apolipoprotein(a) isoform size	rs2457564	A	0.45	0.240	0.022	0.058	0.040	0.144
lipoprotein(a) concentration	rs3777392	T	NA	0.045	0.005	-0.018	0.064	0.775
CRP	rs469772	T	0.81	0.031	0.005	0.049	0.056	0.381
CRP	rs12995480	C	0.83	0.031	0.005	0.058	0.052	0.263
CRP	rs4246598	A	0.46	0.022	0.004	0.001	0.528	0.998
CRP	rs9284725	C	0.24	0.027	0.004	0.010	0.054	0.855
CRP	rs1441169	G	0.47	0.025	0.004	0.020	0.042	0.636
CRP	rs2352975	C	0.30	0.025	0.004	-0.046	0.043	0.287
CRP	rs17658229	C	0.05	0.056	0.010	0.174	0.093	0.062
CRP	rs9271608	G	0.22	0.042	0.005	-0.122	0.051	0.017
CRP	rs12202641	T	0.61	0.023	0.004	-0.035	0.040	0.391
CRP	rs1490384	T	0.49	0.025	0.004	-0.011	0.042	0.793
CRP	rs9385532	C	0.67	0.026	0.004	0.039	0.045	0.379
CRP	rs1880241	G	0.52	0.028	0.004	-0.064	0.040	0.113
CRP	rs2710804	C	0.37	0.021	0.004	-0.130	0.042	0.002
CRP	rs2064009	T	0.58	0.027	0.004	-0.012	0.042	0.774
CRP	rs2891677	T	0.54	0.020	0.004	0.020	0.042	0.634
CRP	rs643434	A	0.37	0.023	0.004	-0.011	0.044	0.802
CRP	rs1051338	G	0.37	0.024	0.004	0.020	0.037	0.593
CRP	rs10832027	A	0.67	0.026	0.004	0.058	0.045	0.199
CRP	rs10838687	T	0.80	0.031	0.004	-0.047	0.050	0.343
CRP	rs1582763	A	0.63	0.022	0.004	-0.069	0.041	0.093
CRP	rs11108056	G	0.58	0.028	0.004	0.068	0.042	0.111
CRP	rs2239222	G	0.36	0.035	0.004	0.010	0.063	0.874
CRP	rs4774590	A	0.65	0.022	0.004	0.030	0.045	0.512
CRP	rs1558902	A	0.42	0.034	0.004	0.010	0.031	0.751
CRP	rs178810	T	0.56	0.020	0.004	-0.057	0.040	0.159
CRP	rs10512597	C	0.82	0.037	0.005	-0.020	0.050	0.687
CRP	rs4092465	G	0.65	0.027	0.004	0.049	0.044	0.267
CRP	rs12960928	C	0.27	0.024	0.004	-0.020	0.045	0.655
CRP	rs2315008	G	0.69	0.023	0.004	0.068	0.045	0.136
CRP	rs2836878	G	0.27	0.043	0.004	0.068	0.045	0.129
CRP	rs6001193	G	0.65	0.028	0.004	-0.042	0.041	0.312
CRP	rs75460349	A	0.97	0.086	0.014	0.086	0.137	0.529
CRP	rs1514895	G	0.29	0.027	0.004	0.068	0.043	0.119
CRP	rs112635299	T	0.98	0.107	0.017	0.077	0.145	0.595
CRP	rs1189402	A	0.62	0.025	0.004	-0.051	0.041	0.212
CRP	rs687339	T	0.22	0.030	0.005	0.039	0.051	0.439
CRP	rs7795281	A	0.76	0.028	0.005	-0.012	0.046	0.794
CRP	rs1736060	T	0.60	0.029	0.004	0.039	0.038	0.298

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				†β <sup>†</sup>	SE	β	SE	p value
CRP	rs9611441	C	0.51	0.022	0.004	0.039	0.038	0.305
Fibrinogen	rs7588285	C	0.20	0.007	0.001	0.020	0.051	0.696
Fibrinogen	rs62246343	T	0.17	0.007	0.001	-0.012	0.052	0.817
Fibrinogen	rs1976714	G	0.65	0.006	0.001	0.039	0.045	0.380
Fibrinogen	rs2710804	C	0.37	0.006	0.001	-0.130	0.042	0.002
Fibrinogen	rs7012814	A	0.47	0.006	0.001	0.010	0.037	0.788
Fibrinogen	rs3138493	C	0.52	0.005	0.001	-0.008	0.039	0.835
Fibrinogen	rs2250644	T	0.33	0.005	0.001	0.030	0.048	0.534
Fibrinogen	rs2420915	G	0.91	0.009	0.002	-0.069	0.071	0.328
Fibrinogen	rs7934094	T	0.78	0.008	0.001	-0.091	0.049	0.064
Fibrinogen	rs7310615	G	0.50	0.007	0.001	-0.031	0.040	0.431
Fibrinogen	rs56702977	A	0.13	0.008	0.001	0.030	0.057	0.605
Fibrinogen	rs1035560	C	0.40	0.006	0.001	0.020	0.049	0.689
Fibrinogen	rs7224737	A	0.24	0.006	0.001	0.030	0.051	0.559
Fibrinogen	rs73058052	T	0.16	0.007	0.001	-0.038	0.054	0.484
Fibrinogen	rs1892534	C	0.62	0.007	0.001	-0.050	0.041	0.225
Fibrinogen	rs61812598	G	0.61	0.012	0.001	0.058	0.038	0.123
Fibrinogen	rs10157379	T	0.62	0.010	0.001	-0.004	0.041	0.922
Fibrinogen	rs1558643	T	0.40	0.006	0.001	0.020	0.053	0.711
Fibrinogen	rs6734238	G	0.41	0.011	0.001	0.049	0.043	0.258
Fibrinogen	rs715	T	0.68	0.008	0.001	-0.012	0.042	0.773
Fibrinogen	rs59104589	C	0.66	0.008	0.001	-0.045	0.041	0.276
Fibrinogen	rs9840812	C	0.23	0.012	0.001	0.058	0.049	0.231
Fibrinogen	rs59950280	A	0.34	0.008	0.001	-0.120	0.043	0.005
Fibrinogen	rs7439150	A	0.20	0.031	0.001	-0.066	0.051	0.193
Fibrinogen	rs2057655	G	0.79	0.020	0.001	-0.064	0.052	0.216
Fibrinogen	rs71520386	T	0.20	0.007	0.001	-0.015	0.050	0.761
Fibrinogen	rs11780978	A	0.40	0.006	0.001	0.068	0.042	0.107
Fibrinogen	rs7916868	A	0.49	0.009	0.001	0.020	0.042	0.635
Fibrinogen	rs11230201	C	0.59	0.006	0.001	-0.068	0.041	0.093
Fibrinogen	rs2731439	C	0.64	0.006	0.001	0.049	0.043	0.253
Fibrinogen	rs12913259	C	0.70	0.007	0.001	-0.102	0.043	0.019
Fibrinogen	rs11859517	C	0.71	0.007	0.001	-0.041	0.044	0.357
Fibrinogen	rs1800961	C	NA	0.017	0.003	0.010	0.100	0.921
Fibrinogen	rs9808651	G	0.73	0.010	0.001	-0.070	0.046	0.123
Fibrinogen	rs150768229	A	0.99	0.039	0.007	-0.326	0.171	0.057
Fibrinogen	rs6054	C	0.99	0.122	0.008	-0.150	0.274	0.585
Fibrinogen	rs148685782	G	0.99	0.218	0.011	0.049	0.316	0.877
Fibrinogen	rs76289367	G	0.15	0.011	0.002	-0.054	0.058	0.349
Fibrinogen	rs12777	G	0.04	0.021	0.002	-0.027	0.100	0.785
IL-1Ra	rs6743376	A	0.43	0.130	0.012	0.020	0.047	0.675
IL-1Ra	rs6761276	C	0.48	0.120	0.012	-0.041	0.041	0.315
IL-1Ra	rs13386602	A	0.44	0.130	0.013	-0.041	0.041	0.314
IL-1Ra	rs6759676	T	0.44	0.130	0.013	-0.041	0.041	0.314

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).

**Supplementary Table 1.** Genetic variant-PD associations in the UK Biobank (cont.)

Risk factor	SNP	EA	Freq	Risk factor		Parkinson's disease results*		
				† $\beta$	SE	$\beta$	SE	<i>p</i> value
IL-1Ra	rs11678375	T	0.44	0.130	0.013	-0.041	0.040	0.312
sIL-6R	rs2228145	A	0.62	0.101	0.018	-0.064	0.041	0.116

HDL = High-density lipoprotein; LDL = Low-density lipoprotein; SNP = Single nucleotide polymorphism; ALA =  $\alpha$ -linolenic acid; DPA = Docosapentaenoic acid; EPA = Eicosapentenoic acid; DHA = Docosahexenoic acid; BMI = Body mass index; WHRadjBMI = Waist-to-hip ratio adjusted for body mass index; CRP = C-reactive protein; IL-1Ra = Interleukin-1 receptor antagonist; sIL-6R = Soluble interleukin-6 receptor; EA = effect allele; Freq = Frequency; NA, not available; SE = standard error. \*Summary statistics from UK Biobank Cohort (1239 Parkinson's disease cases and 451025 controls). †Effect size estimates ( $\beta$  coefficients) were obtained from published genome-wide association studies of the risk factors and represent one unit change in the risk factor per additional copy of the effect allele. The change is expressed in hours per weekday for sleep duration, cigarettes per day for smoking, percentage for 25-hydroxyvitamin D, and standard deviation for the other continuous risk factors. For the binary risk factors, the change is expressed as log-odds of having the risk factor. In the Mendelian randomisation analyses, sleep duration was scaled to one hour of sleep (1 SD = 0.5 hour), smoking to 10 cigarettes, vitamin D to 20% change, morning person to 5% change, vitamin B6 to one SD (assuming one SD = 47.77 pmol/ml), vitamin B12 to one SD (assuming one SD = 0.42 pg/ml), vitamin E to one SD (assuming one SD = 3.4 mg/L), homocysteine to one SD (assuming one SD = 0.14 pg/mL), Se to one SD (assuming one SD = 0.15  $\mu$ g/g), iron to one SD (assuming one SD = 0.15  $\mu$ mol/L), BMI to one SD (assuming one SD = 5.87 kg/m<sup>2</sup>), birth weight to one SD (assuming one SD = 4.83 kg), height to one SD (assuming one SD = 0.91 m), WHRadjBMI to one SD (assuming one SD = 0.07 cm/cm), body fat to 1% change, infant head circumference to one SD (assuming one SD = 1.6 cm), HDL to one SD (assuming one SD = 17.9 mg/dL), LDL to one SD (assuming one SD = 39.9 mg/dL), total cholesterol to one SD (assuming one SD = 43.8 mg/dL), triglycerides to one SD (assuming one SD = 81.8 mg/dL), lipoprotein(a) concentration to one SD (assuming one SD = 5.64 nmol/L), C-reactive protein to one SD (assuming one SD = 1 ln-mg/L), fibrinogen to one SD (assuming one SD = 0.78 g/l), sIL-6R to one SD (assuming one SD = 1.5 ng/ml) and bone mineral density to one SD (assuming one SD = 0.1 g/cm<sup>2</sup>).