

Supplementary table 1. 166 single nuclear polymorphisms (SNPs) were used to construct the PRS for T2DM in the HUNT study (n=3467*)

SNP	Chr	Closest gene	Risk allele	Other allele	RAF [†]	OR	(95% CI)	P value	Coefficient
rs3768321	1	<i>MACF1</i>	T	G	0.18	1.09	(1.07-1.10)	2.6E-26	0.0862
rs58432198	1	<i>FAF1</i>	C	T	0.88	1.07	(1.05-1.09)	2.1E-10	0.0677
rs12140153	1	<i>PATJ</i>	G	T	0.88	1.07	(1.04-1.09)	1.3E-8	0.0677
rs1127215	1	<i>PTGFRN</i>	C	T	0.56	1.05	(1.04-1.06)	1.6E-13	0.0488
rs1493694	1	<i>NOTCH2</i>	T	C	0.12	1.09	(1.07-1.11)	2.7E-16	0.0862
rs145904381	1	<i>FAM63A</i>	T	C	0.98	1.19	(1.12-1.26)	2.6E-8	0.1740
rs539515	1	<i>SEC16B</i>	C	A	0.24	1.05	(1.04-1.07)	1.6E-10	0.0488
rs9430095	1	<i>SRGAP2</i>	C	G	0.52	1.04	(1.02-1.05)	1.9E-8	0.0392
rs340874	1	<i>PROX1</i>	C	T	0.55	1.07	(1.05-1.08)	1.6E-22	0.0677
rs348330	1	<i>ABCB10</i>	G	A	0.35	1.05	(1.04-1.07)	2.7E-14	0.0488
rs62107261	2	<i>TMEM18</i>	T	C	0.97	1.12	(1.08-1.15)	3.8E-12	0.1133
rs11680058	2	<i>FAM49A</i>	A	G	0.88	1.06	(1.04-1.08)	1.4E-8	0.0583
rs1260326	2	<i>GCKR</i>	C	T	0.68	1.07	(1.06-1.08)	6.5E-25	0.0677
rs80147536	2	<i>THADA</i>	A	T	0.92	1.13	(1.11-1.16)	2.7E-29	0.1222
rs10193538	2	<i>BNIP1</i>	T	G	0.63	1.04	(1.02-1.05)	8.9E-9	0.0392
rs243024	2	<i>BCL11A</i>	A	G	0.45	1.06	(1.05-1.07)	2.5E-20	0.0583
rs11688682	2	<i>GLI2</i>	G	C	0.74	1.05	(1.03-1.06)	4.2E-9	0.0488
rs35999103	2	<i>PABPC1P2</i>	T	C	0.16	1.05	(1.03-1.07)	9.7E-9	0.0488
rs13426680	2	<i>CYTIP</i>	A	G	0.93	1.09	(1.06-1.11)	6.7E-10	0.0862
rs10195252	2	<i>GRB14/COBLL1</i>	T	C	0.59	1.07	(1.06-1.08)	6.0E-25	0.0677

rs2972144	2	<i>IRS1</i>	G	A	0.60	1.10	(1.08-1.11)	2.1E-46	0.0953
rs11709077	3	<i>PPARG</i>	G	A	0.86	1.14	(1.11-1.16)	1.8E-36	0.1310
rs35352848	3	<i>UBE2E2</i>	T	C	0.76	1.07	(1.05-1.09)	1.3E-17	0.0677
rs4688760	3	<i>RBM6</i>	T	C	0.70	1.04	(1.03-1.06)	3.5E-10	0.0392
rs9860730	3	<i>ADAMTS9</i>	A	G	0.71	1.06	(1.04-1.07)	4.9E-15	0.0583
rs2272163	3	<i>ROBO2</i>	C	A	0.61	1.04	(1.02-1.05)	9.6E-9	0.0392
rs11708067	3	<i>ADCY5</i>	A	G	0.77	1.09	(1.08-1.11)	5.2E-32	0.0862
rs62271373	3	<i>TSC22D2</i>	A	T	0.04	1.09	(1.06-1.12)	1.0E-9	0.0862
rs7629630	3	<i>EGFEM1P</i>	A	T	0.85	1.05	(1.03-1.07)	2.5E-8	0.0488
rs9873618	3	<i>SLC2A2</i>	G	A	0.69	1.07	(1.05-1.08)	4.8E-21	0.0677
rs6780171	3	<i>IGF2BP2</i>	A	T	0.29	1.14	(1.12-1.16)	9.0E-56	0.1310
rs3887925	3	<i>ST6GAL1</i>	T	C	0.56	1.07	(1.05-1.08)	3.1E-22	0.0677
rs1531583	4	<i>PCGF3</i>	T	G	0.06	1.13	(1.09-1.16)	3.5E-14	0.1222
rs56337234	4	<i>MAEA</i>	C	T	0.51	1.06	(1.04-1.07)	8.6E-18	0.0583
rs12640250	4	<i>LCORL</i>	C	A	0.73	1.04	(1.03-1.05)	3.7E-8	0.0392
rs10938398	4	<i>GNPDA2</i>	A	G	0.40	1.05	(1.03-1.06)	3.6E-12	0.0488
rs2102278	4	<i>USP46</i>	G	A	0.32	1.04	(1.02-1.05)	3.7E-8	0.0392
rs1903002	4	<i>FAM13A</i>	G	C	0.46	1.04	(1.02-1.05)	2.7E-8	0.0392
rs6821438	4	<i>SMARCA1</i>	A	G	0.51	1.04	(1.03-1.06)	4.0E-11	0.0392
rs1580278	4	<i>SLC9B1</i>	C	A	0.45	1.04	(1.03-1.05)	2.2E-10	0.0392
rs1296328	4	<i>PABPC4L</i>	A	C	0.45	1.04	(1.02-1.05)	3.5E-8	0.0392
rs7669833	4	<i>TMEM154</i>	T	A	0.71	1.06	(1.04-1.07)	1.2E-14	0.0583

rs58730668	4	<i>ACSL1</i>	T	C	0.86	1.07	(1.05-1.09)	1.3E-13	0.0677
rs3845281	5	<i>ANKH</i>	G	A	0.90	1.08	(1.06-1.10)	2.3E-11	0.0770
rs17250977	5	<i>ANKH</i>	G	A	0.03	1.12	(1.09-1.16)	2.0E-11	0.1133
rs702634	5	<i>ARL15</i>	A	G	0.68	1.05	(1.04-1.07)	7.7E-14	0.0488
rs9687832	5	<i>ANKRD55</i>	A	G	0.16	1.08	(1.06-1.10)	1.7E-20	0.0770
rs2307111	5	<i>POC5</i>	T	C	0.61	1.05	(1.04-1.07)	2.1E-16	0.0488
rs4457053	5	<i>ZBED3</i>	G	A	0.29	1.06	(1.05-1.08)	8.4E-18	0.0583
rs7719891	5	<i>RASA1</i>	G	A	0.27	1.04	(1.03-1.06)	2.4E-8	0.0392
rs115505614	5	<i>PAM</i>	T	C	0.04	1.19	(1.15-1.22)	1.3E-30	0.1740
rs329122	5	<i>PHF15</i>	A	G	0.44	1.04	(1.03-1.05)	3.6E-9	0.0392
rs9379084	6	<i>RREB1</i>	G	A	0.92	1.11	(1.08-1.13)	3.3E-21	0.1044
rs7756992	6	<i>CDKAL1</i>	G	A	0.27	1.15	(1.13-1.17)	2.4E-88	0.1398
rs6458354	6	<i>VEGFA</i>	C	T	0.30	1.05	(1.04-1.07)	2.1E-12	0.0488
rs3798519	6	<i>TFAP2B</i>	C	A	0.18	1.06	(1.04-1.08)	2.6E-12	0.0583
rs4946812	6	<i>BEND3</i>	G	A	0.65	1.04	(1.03-1.05)	8.2E-9	0.0392
rs11759026	6	<i>CENPW</i>	G	A	0.25	1.07	(1.05-1.08)	2.4E-18	0.0677
rs9494624	6	<i>SLC35D3</i>	A	G	0.29	1.04	(1.03-1.06)	6.1E-9	0.0392
rs474513	6	<i>SLC22A3</i>	A	G	0.52	1.04	(1.03-1.05)	8.1E-10	0.0392
rs4709746	6	<i>QKI</i>	C	T	0.84	1.06	(1.04-1.08)	5.8E-9	0.0583
rs17168486	7	<i>DGKB</i>	T	C	0.17	1.07	(1.06-1.09)	2.3E-17	0.0677
rs10228066	7	<i>DGKB</i>	T	C	0.52	1.07	(1.06-1.09)	1.1E-28	0.0677
rs1708302	7	<i>JAZF1</i>	C	T	0.55	1.10	(1.08-1.11)	1.1E-48	0.0953

rs878521	7	<i>GCK</i>	A	G	0.23	1.06	(1.04-1.07)	1.9E-13	0.0583
rs11496066	7	<i>FBXL13</i>	T	C	0.83	1.08	(1.05-1.11)	1.1E-8	0.0770
rs6976111	7	<i>CTTNBP2</i>	A	C	0.34	1.04	(1.03-1.06)	1.2E-8	0.0392
rs1562396	7	<i>KLF14</i>	G	A	0.30	1.06	(1.05-1.08)	9.9E-18	0.0583
rs6459733	7	<i>MNX1</i>	G	C	0.69	1.06	(1.05-1.07)	2.4E-17	0.0583
rs10096633	8	<i>LPL</i>	C	T	0.89	1.07	(1.05-1.09)	1.1E-12	0.0677
rs10954772	8	<i>PURG</i>	T	C	0.28	1.04	(1.03-1.06)	1.8E-9	0.0392
rs13262861	8	<i>ANK1</i>	C	A	0.86	1.07	(1.05-1.09)	4.0E-12	0.0677
rs10097617	8	<i>TP53INP1</i>	T	C	0.53	1.04	(1.03-1.06)	3.3E-11	0.0392
rs3802177	8	<i>SLC30A8</i>	G	A	0.69	1.11	(1.10-1.13)	1.1E-55	0.1044
rs17772814	8	<i>CASC11</i>	G	A	0.91	1.08	(1.05-1.11)	5.4E-10	0.0770
rs1561927	8	<i>PVT1</i>	C	T	0.27	1.04	(1.03-1.06)	1.5E-9	0.0392
rs4977213	8	<i>BOP1</i>	C	T	0.32	1.05	(1.04-1.07)	9.1E-14	0.0488
rs12719778	8	<i>BOP1</i>	T	C	0.55	1.04	(1.03-1.05)	5.0E-9	0.0392
rs10974438	9	<i>GLIS3</i>	C	A	0.35	1.05	(1.04-1.07)	1.5E-14	0.0488
rs7022807	9	<i>HAUS6</i>	G	A	0.39	1.04	(1.03-1.05)	2.7E-10	0.0392
rs10811660	9	<i>CDKN2A/B</i>	G	A	0.83	1.27	(1.24-1.29)	1.4E-115	0.2390
rs1412234	9	<i>LINGO2</i>	C	T	0.31	1.04	(1.03-1.06)	1.9E-10	0.0392
rs12001437	9	<i>UBAP2</i>	C	T	0.37	1.04	(1.03-1.06)	2.8E-10	0.0392
rs17791513	9	<i>TLE4</i>	A	G	0.93	1.10	(1.08-1.13)	3.1E-14	0.0953
rs2796441	9	<i>TLE1</i>	G	A	0.58	1.07	(1.05-1.08)	4.4E-24	0.0677
rs55653563	9	<i>ZNF169</i>	A	C	0.74	1.04	(1.03-1.06)	2.2E-9	0.0392

rs505922	9	<i>ABO</i>	C	T	0.37	1.05	(1.03-1.06)	3.9E-12	0.0488
rs28505901	9	<i>GPSM1</i>	G	A	0.73	1.09	(1.07-1.11)	6.7E-26	0.0862
rs11257655	10	<i>CDC123/CAMK1D</i>	T	C	0.20	1.09	(1.08-1.11)	1.5E-32	0.0862
rs703972	10	<i>ZMIZ1</i>	G	C	0.54	1.07	(1.06-1.09)	1.7E-29	0.0677
rs10882101	10	<i>HHEX/IDE</i>	T	C	0.57	1.06	(1.04-1.08)	1.4E-8	0.0583
rs184509201	10	<i>TCF7L2</i>	C	G	0.99	1.21	(1.15-1.27)	1.2E-13	0.1906
rs7903146	10	<i>TCF7L2</i>	T	C	0.26	1.37	(1.35-1.39)	5.8E-447	0.3148
rs4929965	11	<i>INS/IGF2</i>	A	G	0.38	1.07	(1.06-1.09)	4.0E-26	0.0677
rs2283220	11	<i>KCNQ1</i>	A	G	0.69	1.05	(1.03-1.06)	1.4E-9	0.0488
rs2237895	11	<i>KCNQ1</i>	C	A	0.45	1.12	(1.11-1.14)	6.0E-52	0.1133
rs141521721	11	<i>PDE3B</i>	A	C	0.01	1.13	(1.08-1.17)	2.7E-8	0.1222
rs5213	11	<i>KCNJ11</i>	C	T	0.40	1.07	(1.06-1.09)	3.5E-27	0.0677
rs145678014	11	<i>QSER1</i>	G	T	0.96	1.11	(1.07-1.14)	2.0E-10	0.1044
rs1061810	11	<i>HSD17B12</i>	A	C	0.28	1.05	(1.04-1.07)	6.0E-13	0.0488
rs1783541	11	<i>MAP3K11</i>	T	C	0.19	1.06	(1.05-1.08)	2.0E-14	0.0583
rs77464186	11	<i>CENTD2/ARAP1</i>	A	C	0.82	1.11	(1.09-1.13)	4.7E-33	0.1044
rs10830963	11	<i>MTNR1B</i>	G	C	0.27	1.10	(1.09-1.12)	4.8E-43	0.0953
rs10750397	11	<i>ETSI</i>	A	G	0.29	1.05	(1.04-1.07)	8.3E-13	0.0488
rs67232546	11	<i>ETSI</i>	T	C	0.18	1.06	(1.04-1.07)	1.3E-11	0.0583
rs11063028	12	<i>CCND2</i>	C	T	0.15	1.06	(1.04-1.07)	8.5E-11	0.0583
rs4238013	12	<i>CCND2</i>	C	T	0.23	1.06	(1.04-1.07)	3.2E-11	0.0583
rs76895963	12	<i>CCND2</i>	T	G	0.98	1.62	(1.54-1.71)	1.4E-69	0.4824

rs10842994	12	<i>KLHDC5</i>	C	T	0.80	1.08	(1.06-1.09)	4.1E-20	0.0770
rs2258238	12	<i>HMGA2</i>	T	A	0.11	1.10	(1.08-1.13)	4.5E-21	0.0953
rs1796330	12	<i>TSPAN8/LGR5</i>	G	C	0.54	1.05	(1.04-1.06)	2.2E-14	0.0488
rs2197973	12	<i>USP44</i>	T	C	0.54	1.04	(1.02-1.05)	3.6E-8	0.0392
rs77864822	12	<i>RMST</i>	A	G	0.91	1.08	(1.05-1.11)	1.1E-8	0.0770
rs1426371	12	<i>WSCD2</i>	G	A	0.75	1.05	(1.04-1.07)	8.2E-12	0.0488
rs34965774	12	<i>KSR2</i>	A	G	0.15	1.06	(1.04-1.08)	2.0E-9	0.0583
rs56348580	12	<i>HNFA</i>	G	C	0.71	1.05	(1.04-1.07)	2.3E-13	0.0488
rs12811407	12	<i>FBRSL1</i>	A	G	0.35	1.05	(1.04-1.07)	1.7E-12	0.0488
rs34584161	13	<i>RNF6</i>	A	G	0.76	1.05	(1.03-1.06)	2.2E-10	0.0488
rs11842871	13	<i>HMGB1</i>	G	T	0.72	1.04	(1.03-1.06)	1.2E-8	0.0392
rs9563615	13	<i>SRGAP2D</i>	A	T	0.73	1.05	(1.03-1.06)	6.4E-11	0.0488
rs1359790	13	<i>SPRY2</i>	G	A	0.72	1.09	(1.07-1.10)	2.4E-31	0.0862
rs7987740	13	<i>IRS2</i>	T	C	0.62	1.04	(1.02-1.05)	4.0E-8	0.0392
rs17122772	14	<i>SLC7A7</i>	G	C	0.24	1.04	(1.03-1.06)	1.6E-8	0.0392
rs17522122	14	<i>AKAP6</i>	T	G	0.47	1.04	(1.03-1.05)	3.2E-9	0.0392
rs17836088	14	<i>NRXN3</i>	C	G	0.19	1.06	(1.04-1.08)	6.7E-14	0.0583
rs8010382	14	<i>SMEK1</i>	G	A	0.43	1.04	(1.03-1.05)	6.5E-9	0.0392
rs62007683	14	<i>MARK3</i>	G	T	0.63	1.04	(1.02-1.05)	3.1E-8	0.0392
rs34715063	15	<i>RASGRP1</i>	C	T	0.14	1.1	(1.07-1.12)	2.3E-19	0.0953
rs8037894	15	<i>C2CD4A/B</i>	G	C	0.53	1.05	(1.03-1.06)	2.6E-13	0.0488
rs7178762	15	<i>USP3</i>	C	T	0.48	1.04	(1.03-1.05)	5.4E-10	0.0392

rs1005752	15	<i>HMG20A</i>	A	C	0.71	1.08	(1.07-1.10)	2.5E-29	0.0770
rs4932265	15	<i>AP3S2</i>	T	C	0.27	1.07	(1.05-1.08)	4.2E-20	0.0677
rs6600191	16	<i>ITFG3</i>	T	C	0.84	1.06	(1.05-1.08)	9.3E-13	0.0583
rs3751837	16	<i>CLUAP1</i>	T	C	0.22	1.04	(1.03-1.06)	1.4E-8	0.0392
rs11642430	16	<i>FAM57B</i>	G	C	0.41	1.04	(1.03-1.05)	2.2E-9	0.0392
rs1421085	16	<i>FTO</i>	C	T	0.42	1.13	(1.12-1.15)	3.1E-84	0.1222
rs72802342	16	<i>BCAR1</i>	C	A	0.92	1.17	(1.14-1.20)	4.0E-32	0.1570
rs2925979	16	<i>CMIP</i>	T	C	0.31	1.05	(1.04-1.07)	1.4E-14	0.0488
rs12920022	16	<i>SPG7</i>	A	T	0.16	1.05	(1.04-1.07)	3.4E-9	0.0488
rs1377807	17	<i>ZZEF1</i>	C	G	0.29	1.05	(1.04-1.07)	4.2E-13	0.0488
rs7222481	17	<i>GLP2R</i>	C	G	0.31	1.04	(1.03-1.05)	1.4E-8	0.0392
rs4925109	17	<i>RAI1</i>	A	G	0.29	1.05	(1.03-1.06)	2.8E-12	0.0488
rs71372253	17	<i>NF1</i>	C	T	0.06	1.08	(1.05-1.10)	4.4E-8	0.0770
rs10908278	17	<i>HNF1B</i>	T	A	0.45	1.08	(1.07-1.10)	6.4E-36	0.0770
rs35895680	17	<i>TTL6</i>	C	A	0.70	1.06	(1.04-1.07)	2.5E-15	0.0583
rs60276348	17	<i>ACE</i>	T	C	0.11	1.05	(1.03-1.07)	2.6E-8	0.0488
rs61676547	17	<i>BPTF</i>	C	G	0.19	1.06	(1.04-1.07)	2.9E-11	0.0583
rs7240767	18	<i>LAMA1</i>	C	T	0.39	1.04	(1.02-1.05)	1.6E-8	0.0392
rs62080313	18	<i>COMMD9</i>	C	T	0.10	1.06	(1.04-1.08)	1.0E-8	0.0583
rs72926932	18	<i>TCF4</i>	C	A	0.08	1.09	(1.07-1.12)	1.0E-14	0.0862
rs17684074	18	<i>WDR7</i>	G	C	0.72	1.04	(1.03-1.06)	2.9E-8	0.0392
rs9957145	18	<i>GRP</i>	G	A	0.87	1.05	(1.03-1.07)	8.1E-9	0.0488

rs4804833	19	MAP2K7	A	G	0.39	1.05	(1.03-1.06)	7.7E-13	0.0488
rs3111316	19	FARSA	A	G	0.59	1.05	(1.03-1.06)	6.3E-13	0.0488
rs8107974	19	TM6SF2	T	A	0.09	1.10	(1.07-1.12)	3.3E-15	0.0953
rs10406327	19	PEPD	C	G	0.50	1.04	(1.02-1.05)	3.8E-8	0.0392
rs429358	19	TOMM40/APOE	T	C	0.82	1.08	(1.06-1.10)	2.6E-18	0.0770
rs10406431	19	GIPR	A	G	0.53	1.05	(1.04-1.06)	9.6E-14	0.0488
rs13041756	20	NKX2.2	C	T	0.10	1.06	(1.04-1.08)	1.4E-8	0.0583
rs2268078	20	RALY	A	G	0.68	1.04	(1.03-1.06)	2.3E-10	0.0392
rs1800961	20	HNF4A	T	C	0.05	1.18	(1.15-1.23)	2.3E-22	0.1655
rs11699802	20	CEBPB	C	T	0.57	1.04	(1.03-1.06)	1.8E-11	0.0392
rs6070625	20	GNAS	G	C	0.55	1.05	(1.04-1.06)	5.3E-14	0.0488
rs6518681	22	MTMR3/ASCC2	G	A	0.93	1.09	(1.06-1.11)	1.1E-12	0.0862
rs117001013	22	YWHAH	C	T	0.91	1.07	(1.04-1.09)	1.7E-8	0.0677
rs738408	22	PNPLA3	T	C	0.24	1.05	(1.03-1.07)	1.4E-10	0.0488

HUNT: the Trøndelag Health Study; OR: odds ratio; PRS: polygenic risk score; RAF: risk allele frequency; T2DM: type 2 diabetes mellitus

*Missing information on SNPs in 107 participants

†RAF was based on approximately 72 000 participants in the HUNT study

OR with 95% CI and *P* value are from the study by Mahajan *et al.*¹ The coefficients were ln(OR) and were used as weights to calculate the PRS.

1. Mahajan A, Taliun D, Thurner M, et al. Fine-mapping type 2 diabetes loci to single-variant resolution using high-density imputation and islet-specific epigenome maps. *Nat Genet* 2018;50(11):1505-13. doi: 10.1038/s41588-018-0241-6 [published Online First: 2018/10/10]

Supplementary table 2. Association between baseline seasonal-standardized serum 25(OH)D level and the 11-year risk of T2DM

Analyses after performing multiple imputation of missing data of covariates

Seasonal-standardized serum 25(OH)D level (nmol/L)	No. of participants	No. of cases	Risk (%)	Adjusted OR (95% CI)*
Categorical				
<50.0	2059	67	3.3%	1.63 (0.99 to 2.69)
≥50.0	1515	25	1.7%	1.00 (reference)
Continuous [†]				
	3574	92	2.6%	1.27 (0.86 to 1.89)

25(OH)D: 25-hydroxyvitamin D; CI: confidence interval; OR: odds ratio; T2DM: type 2 diabetes mellitus

T2DM was defined as reported diabetes and/or non-fasting serum glucose levels of ≥ 11 mmol/L and the value of serum glutamic acid decarboxylase antibodies (GADA) < 0.08 ai.

*Adjusted for age, sex, education, economic difficulties, BMI, smoking status, alcohol consumption, physical activity, sitting time per day, family history of diabetes and chronic diseases

[†]per 25 nmol/L decrease in serum 25(OH)D

Supplementary table 3. Baseline characteristics of those who did not or did participate in HUNT3 in the 10% random sample of HUNT2 participants with available 25(OH)D level (n=6377)

	Did not participate in HUNT3 (n=2706)	Participated in HUNT3 (n=3671)
Age (years)	54.2±20.4	46.9±13.5
BMI (kg/m²)	26.6±4.4	26.1±3.8
25(OH)D (nmol/L)	47.2±18.3	48.5±16.1
Sex		
Female	1384 (51.1%)	2011 (54.8%)
Male	1322 (48.9%)	1660 (45.2%)
Education (years)		
<10	1082 (40.0%)	1098 (29.9%)
10-12	740 (27.3%)	1345 (36.6%)
≥13	641 (23.7%)	1133 (30.9%)
Unknown	243 (9.0%)	95 (2.6%)
Economic difficulties		
No	951 (35.1%)	2174 (59.2%)
Yes	510 (18.8%)	794 (21.6%)
Unknown	1245 (46.0%)	703 (19.2%)
Smoking status		
Never	1093 (40.4%)	1097 (29.9%)
Former	1068 (39.5%)	1869 (50.9%)

Current	263 (9.7%)	441 (12.0%)
Unknown	282 (10.4%)	264 (7.2%)
Alcohol intake per month [0 (abstainer)/1–4/≥5/unknown]		
0 (abstainer)	1093 (40.4%)	1097 (29.9%)
1-4	1068 (39.5%)	1869 (50.9%)
≥5	263 (9.7%)	441 (12.0%)
Unknown	282 (10.4%)	264 (7.2%)
Physical activity		
Inactive	598 (22.1%)	769 (20.9%)
Low	433 (16.0%)	688 (18.7%)
Moderate	467 (17.3%)	911 (24.8%)
High	214 (7.9%)	330 (9.0%)
Unknown	994 (36.7%)	973 (26.5%)
Sitting time, hours/day		
≤4	591 (21.8%)	984 (26.8%)
5-7	613 (22.7%)	900 (24.5%)
≥8	691 (25.5%)	1108 (30.2%)
Unknown	811 (30.0%)	679 (18.5%)
Family history of diabetes		
No	1691 (62.5%)	2547 (69.4%)
Yes	389 (14.4%)	617 (16.8%)
Unknown	626 (23.1%)	507 (13.8%)

Chronic diseases

No	1432 (52.9%)	2575 (70.1%)
Yes	1128 (41.7%)	997 (27.2%)
Unknown	146 (5.4%)	99 (2.7%)

25(OH)D: 25-hydroxyvitamin D; BMI: body mass index; HUNT: the Trøndelag Health Study; T2DM: type 2 diabetes mellitus

Data are given as number of participants (column percentage) or mean±standard deviation.

Supplementary figure 1. Association between baseline seasonal-standardized serum 25(OH)D level and the 11-year risk of T2DM, stratified by PRS for T2DM. The PRS for T2DM was classified as a binary variable using different cut-off values

PRS cut-off groups	No. of participants	No. of cases	Risk (%)		OR*	95% CI
PRS top 1/2	1734	62	3.6		1.67	(0.89 to 3.16)
PRS bottom 1/2	1733	22	1.3		1.34	(0.47 to 3.78)
PRS top 1/3	1155	53	4.6		1.78	(0.86 to 3.73)
PRS bottom 2/3	2312	31	1.3		1.00	(0.44 to 2.31)
PRS top 1/4	866	43	5.0		1.70	(0.72 to 3.98)
PRS bottom 3/4	2601	41	1.6		1.16	(0.56 to 2.40)
PRS top 1/5	693	35	5.1		1.37	(0.56 to 3.36)
PRS bottom 4/5	2774	49	1.8		1.47	(0.74 to 2.90)

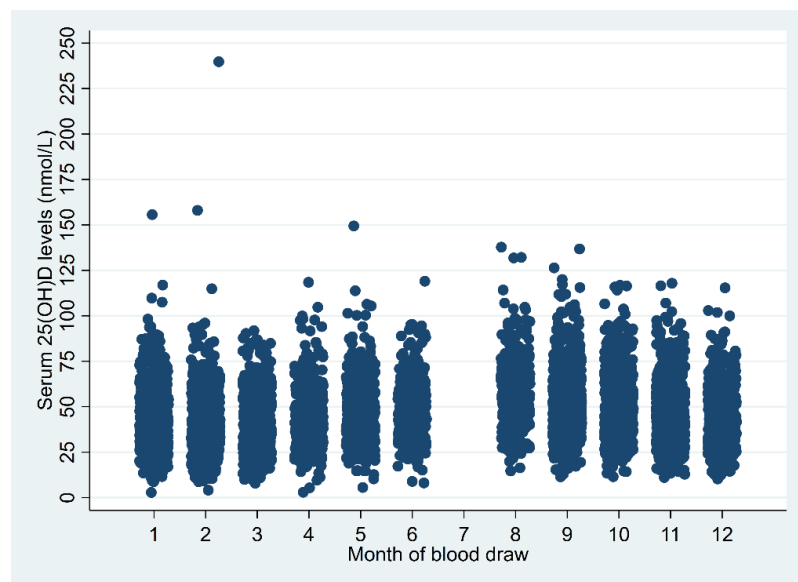
0.50 1.01.41
OR with 95% CI

*The ORs represent the relative risk for incident T2DM in adults with 25(OH)D level <50 nmol/L compared with those of ≥ 50.0 nmol/L and were adjusted for age, sex, education, economic difficulties, BMI, smoking status, alcohol consumption, physical activity, sitting time per day, family history of diabetes and chronic diseases.

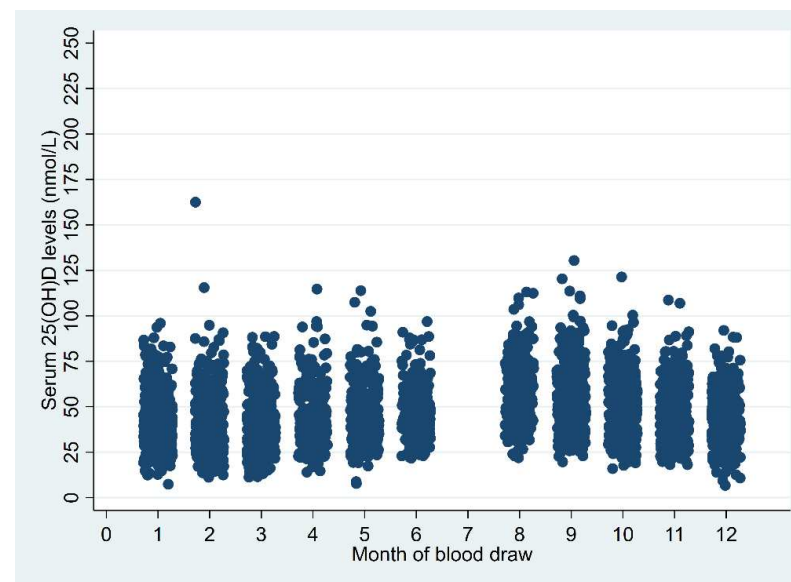
25(OH)D: 25-hydroxyvitamin D; CI: confidence interval; OR: odds ratio; PRS: polygenic risk score; T2DM: type 2 diabetes mellitus.

Supplementary figure 2. Distribution of serum 25(OH)D levels (nmol/L) by month of blood draw (January–December) in the HUNT2 survey

(A) The random sample of HUNT2 (n=6377)



(B) The analysis sample of HUNT2 (n=3574)



The figure shows the distribution of measured serum 25(OH)D by month of blood draw in the 10% random sample of HUNT2 participants whose blood sample were available [(A): n=6377] and in the analysis sample [(B): n=3574]. Levels of serum 25(OH)D are higher around summer and early autumn months (June–October) when sun exposure is greater, and lower in winter. The patterns are similar between the two samples, indicating less likely selection bias.

25(OH)D: 25-hydroxyvitamin D; HUNT: the Trøndelag Health Study