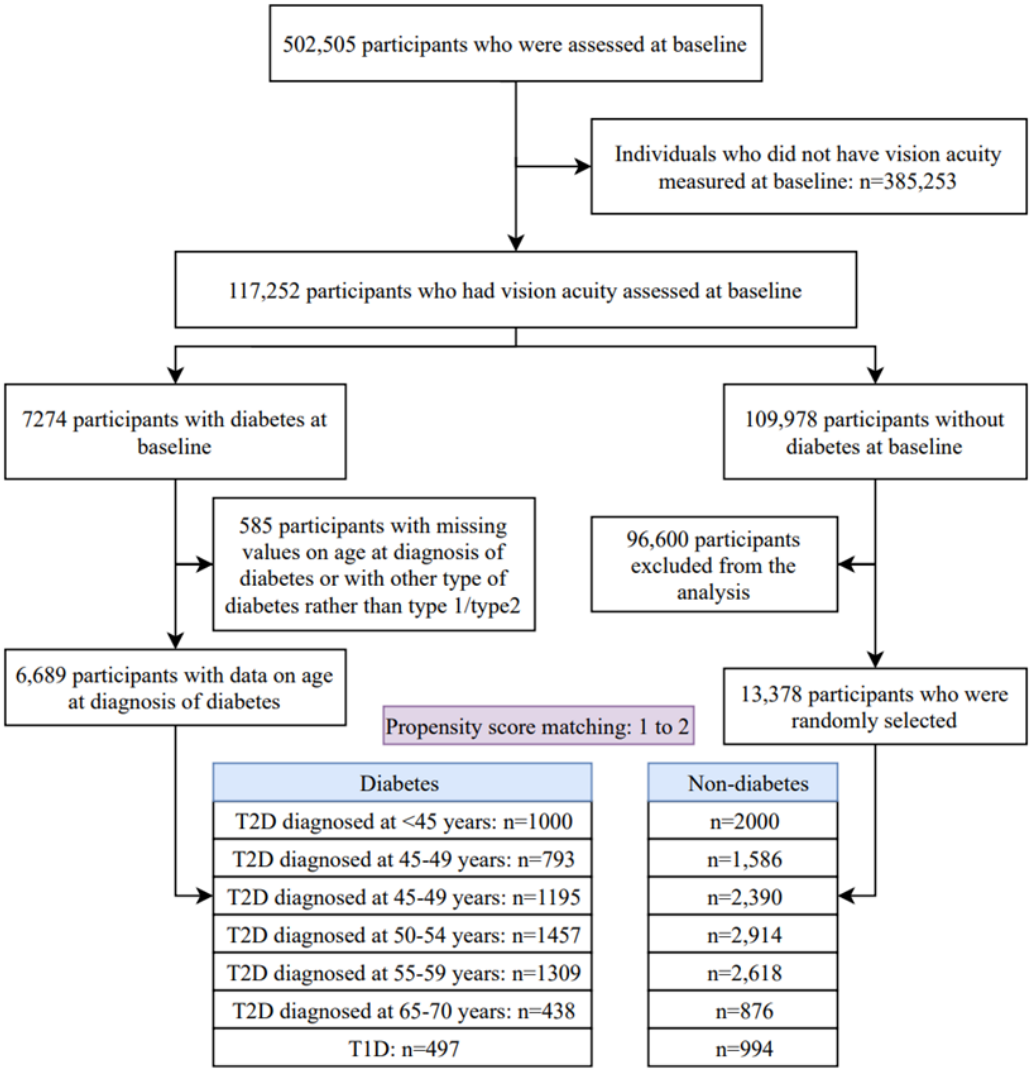

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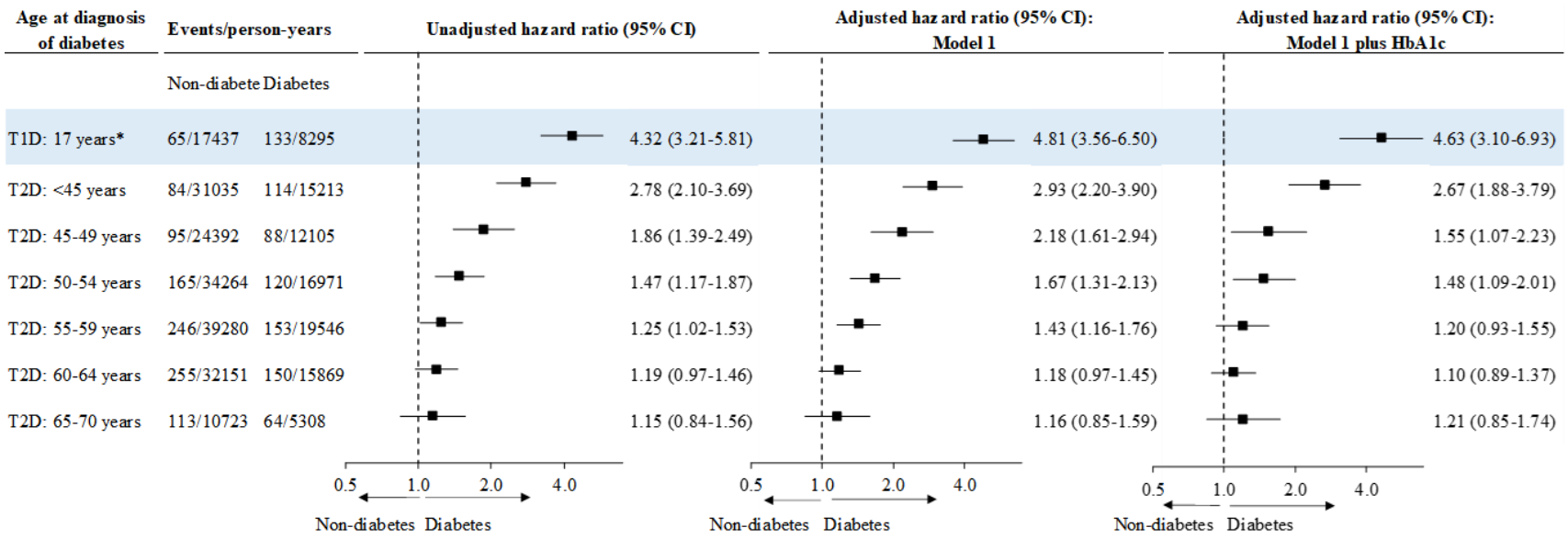
Supplementary Figure 1 Flowchart for population selection for analysis of vision acuity from the UK Biobank. AMD: Age-related macular degeneration; T1D: Type 1 diabetes; T2D: Type 2 diabetes. Propensity score matching was to select two controls for each diabetic participant. The analysis was conducted for age groups of diabetes diagnosis separately. The median age at diagnosis type 1 was 17 years. diabetes Propensity score accounted for age, gender, ethnicity, education, household income, physical activity, smoking, alcohol consumption, sleep duration, depression, hypertension, heart disease, stroke, BMI, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglyceride.



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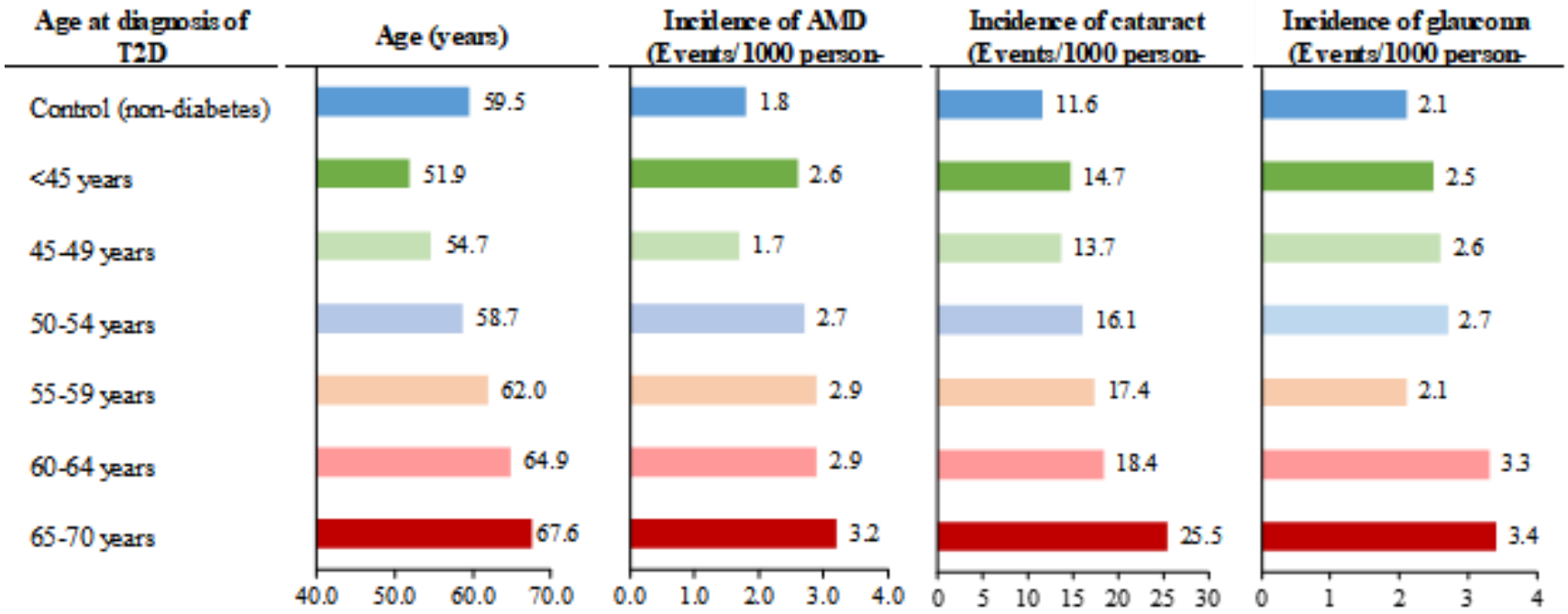
Supplementary Figure 2 Risk for cataract surgery associated with age at diagnosis of diabetes. Cox proportional hazard regression models were used to examine the association between diabetes and incident cataract surgery for each group of diabetes diagnosis age. The multivariable model was adjusted for age, gender, ethnicity, income, education, alcohol consumption, physical activity, sleep duration, smoking, BMI, depression, hypertension, heart disease, stroke, HDL-C, LDL-C, and triglyceride. Central squares of each horizontal line represent the hazard ratio for each subgroup. Horizontal lines indicate the range of the 95% confidence interval. The vertical dash lines indicate the hazard ratio of 1.0.



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Supplementary Figure 3 Age and incidence of ocular conditions according to age at diagnosis of diabetes. Sensitivity analysis was conducted to randomly select controls for each individual with type 2 diabetes with all diabetic patients as a whole.

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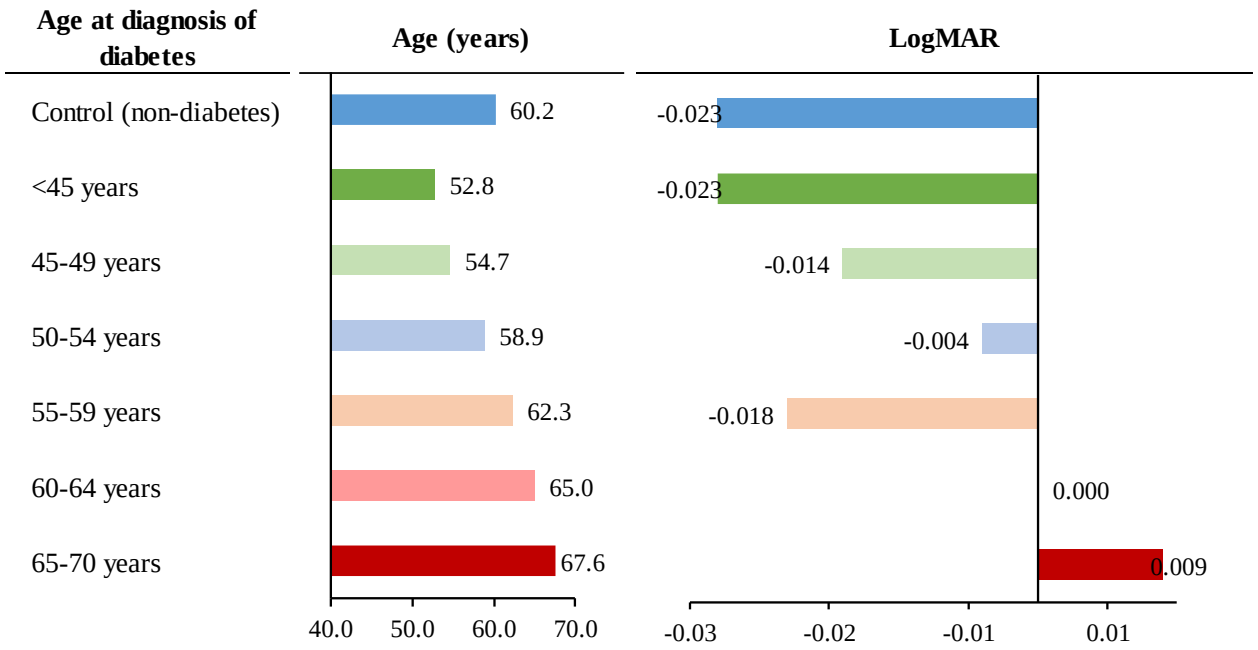

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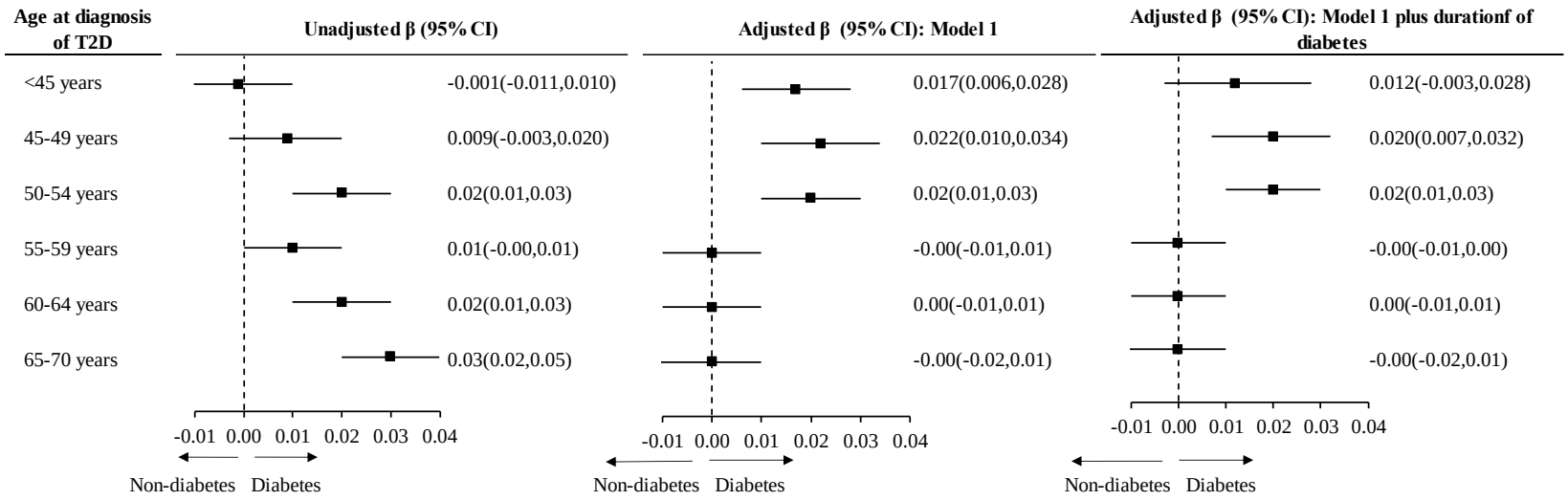
Supplementary Figure 4 Age and vision acuity according to age at diagnosis of type 2 diabetes. Sensitivity analysis was conducted to randomly select controls for each individual with type 2 diabetes with all diabetic patients as a whole.



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Supplementary Figure 5 Vision acuity associated with age at diagnosis of diabetes with the same reference. Sensitivity analysis was conducted to randomly select controls for each individual with type 2 diabetes with all diabetic patients as a whole.General linear regression models were used to estimate β (95% CI) for LogMAR associated with age at diagnosis of diabetes with controls as the reference for all groups of age at diagnosis of diabetes. Multivariable analysis was adjusted for age, gender, ethnicity, income, education, alcohol consumption, physical activity, sleep duration, smoking, BMI, depression, hypertension, heart disease, HDL-C, LDL-C, triglyceride, and HbA1c. Central squares of each horizontal line represent the β for each subgroup. Horizontal lines indicate the range of the 95% confidence interval. The vertical dash lines represent the β of 0.

Supplementary Table 1 Codes for international classification disease, self-reported fields, and OPCS4 for ocular conditions

	ICD 9	ICD 10	Self-reported	OPCS4
Cataract	366, 3662, 3664, 3665, 3668, 3669	H25, H250, H251, H252, H258, H259, H26, H260, H261, H262, H263, H264, H268, H269, H28, H280, H281, H282	1278	C71.2, C75.1
Glaucoma	365, 3650, 3651, 3652, 3655, 3656, 3659	H40, H400, H401, H402, H403, H404, H405, H406, H408, H409, H42, H420, H428	1277	
AMD	3625	H353	1528	
T1D	25000, 25002, 25010, 25012, 25020, 25022, 25030, 25032, 25040, 25042, 25050, 25052, 25060, 25062, 25070, 25072, 25080, 25082, 25090, 25092	E10		
T2D	25001, 25003, 25011, 25013, 25021, 25023, 25031, 25033, 25041, 25043, 25051, 25053, 25061, 25063, 25071,	E11-E14		

25073, 25081, 25083,
25091, 25093

Supplementary Table 2 Baseline characteristics of participants by type 1 diabetes and controls for ocular disease analysis

	Non-T1D	T1D
Age (years)	54.9 ± 8.8	54.7 ± 8.1
Gender		
Female	664 (41.9)	325 (41.0)
Male	920 (58.1)	467 (59.0)
Ethnicity		
Whites	1411 (89.1)	710 (89.6)
Non-whites	163 (10.3)	76 (9.6)
Unknown	10 (0.6)	6 (0.8)
Education		
0-5 years	496 (31.3)	240 (30.3)
6-12 years	792 (50.0)	396 (50.0)
≥13 years	264 (16.7)	135 (17.0)
Missing	32 (2.0)	21 (2.7)
Household income (pounds)		
<18,000	379 (23.9)	196 (24.7)
18,000-30,999	310 (19.6)	158 (19.9)
31,000-51,999	289 (18.2)	172 (21.7)
52,000-100,000	246 (15.5)	95 (12.0)
>100,000	60 (3.8)	23 (2.9)
Unknown	89 (5.6)	56 (7.1)
Not answered	211 (13.3)	92 (11.6)
Physical activity (MET-minutes/week)	2307 ± 2088	2410 ± 2494
Alcohol consumption		
Never	124 (7.8)	64 (8.1)
Previous	106 (6.7)	68 (8.6)
Current	1333 (84.2)	656 (82.8)

Missing	21 (1.3)	4 (0.5)
Smoking		
Never	814 (51.4)	413 (52.1)
Former	554 (35.0)	263 (33.2)
Current	195 (12.3)	110 (13.9)
Missing	21 (1.3)	6 (0.8)
Sleep duration (hours)		
<7	405 (25.6)	220 (27.8)
7-9	1099 (69.4)	520 (65.7)
>9	65 (4.1)	43 (5.4)
Missing	15 (0.9)	9 (1.1)
BMI (kg/m^2)	29.0 ± 6.0	28.8 ± 5.6
Cholesterol (mmol/L)	4.70 ± 1.01	4.67 ± 0.97
HDL-C (mmol/L)	1.44 ± 0.41	1.44 ± 0.40
LDL-C (mmol/L)	2.75 ± 0.74	2.72 ± 0.74
Triglycerides (mmol/L)	1.56 ± 0.94	1.57 ± 1.12
HbA1c (mmol/mol)	35.6 ± 4.3	60.8 ± 15.7*
Hypertension	858 (54.2)	430 (54.3)
Heart disease	206 (13.0)	90 (11.4)
Depression	116 (7.3)	64 (8.1)

Data are means ± standard deviations, or N (%). BMI, body mass index; HbA1c, glycosylated haemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; MET, metabolic equivalent; T1D, type 1 diabetes.

*Refers to significant difference between diabetes participants and controls. T-test was used to test the difference of continuous variables between diabetes participants and controls and Chi-square for categorical variables.

Supplementary Table 3 Baseline characteristics of participants by type 1 diabetes and controls for vision acuity analysis

	Non-T1D	T1D
Age (years)	56.3 ± 8.6	55.8 ± 8.5
Gender		
Female	428 (43.1)	215 (43.3)
Male	566 (56.9)	282 (56.7)
Ethnicity		
Whites	846 (85.1)	419 (84.3)
Non-whites	130 (13.1)	73 (14.7)
Unknown	18 (1.8)	5 (1.0)
Education		
0-5 years	286 (28.8)	163 (32.8)
6-12 years	499 (50.2)	244 (49.1)
≥13 years	179 (18.0)	80 (16.1)
Missing	30 (3.0)	10 (2.0)
Household income (pounds)		
<18,000	209 (21.0)	112 (22.5)
18,000-30,999	209 (21.0)	94 (18.9)
31,000-51,999	173 (17.4)	105 (21.1)
52,000-100,000	147 (14.8)	72 (14.5)
>100,000	38 (3.8)	14 (2.8)
Unknown	49 (4.9)	41 (8.2)
Not answered	169 (17.0)	59 (11.9)
Physical activity (MET-minutes/week)	2280 ± 1918	2327 ± 2284
Alcohol consumption		
Never	72 (7.2)	48 (9.7)
Previous	61 (6.1)	38 (7.6)
Current	842 (84.7)	408 (82.1)

Missing	19 (1.9)	3 (0.6)
Smoking		
Never	486 (48.9)	262 (52.7)
Former	382 (38.4)	164 (33.0)
Current	110 (11.1)	63 (12.7)
Missing	16 (1.6)	8 (1.6)
Sleep duration (hours)		*
<7	211 (21.2)	140 (28.2)
7-9	737 (74.1)	331 (66.6)
>9	24 (2.4)	20 (4.0)
Missing	22 (2.2)	6 (1.2)
BMI (kg/m^2)	29.1 ± 5.7	28.7 ± 5.6
Cholesterol (mmol/L)	4.67 ± 1.00	4.61 ± 0.93
HDL-C (mmol/L)	1.44 ± 0.42	1.45 ± 0.39
LDL-C (mmol/L)	2.73 ± 0.75	2.68 ± 0.71
Triglycerides (mmol/L)	1.47 ± 0.81	1.49 ± 1.02
HbA1c (mmol/mol)	35.9 ± 4.9	59.0 ± 15.8*
Hypertension	509 (51.2)	252 (50.7)
Heart disease	93 (9.4)	52 (10.5)
Depression	71 (7.1)	34 (6.8)

Data are means ± standard deviations, or N (%). BMI, body mass index; HbA1c, glycosylated haemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL-C, low-density lipoprotein cholesterol; MET, metabolic equivalent; T1D, type 1 diabetes.

*Refers to significant difference between diabetes participants and controls. T-test was used to test the difference of continuous variables between diabetes participants and controls and Chi-square for categorical variables.