

Supplementary Table 1 Baseline characteristics of patients with diabetes aged 25-84 years and without heart failure at baseline in the QResearch derivation cohort by sex.

	women (%)	men (%)
type1	11526 (6.0)	13724 (5.6)
type2	181370 (94.0)	231186 (94.4)
Diet control	68724 (35.6)	87548 (35.7)
Oral hypoglycaemics only	99572 (51.6)	128663 (52.5)
Oral hypoglycaemics + insulin	182 (0.1)	217 (0.1)
Insulin only	12892 (6.7)	14758 (6.0)
Years since diagnosis of diabetes		
< 1year	104788 (54.3)	132553 (54.1)
1-3 years	32204 (16.7)	42434 (17.3)
4-6 years	18146 (9.4)	22896 (9.3)
7-10 years	15199 (7.9)	19038 (7.8)
≥11 years	22559 (11.7)	27989 (11.4)
mean age (SD)	61.1 (14.1)	59.1 (13.4)
mean Townsend deprivation score (SD) [§]	.8 (3.4)	.5 (3.4)
Ethnicity		
Ethnicity recorded	146490 (75.9)	184868 (75.5)
White/not recorded [‡]	158237 (82.0)	205465 (83.9)
Indian	6701 (3.5)	8833 (3.6)
Pakistani	4899 (2.5)	5614 (2.3)
Bangladeshi	5894 (3.1)	6550 (2.7)
Other Asian	3098 (1.6)	3974 (1.6)
Caribbean	5470 (2.8)	4505 (1.8)
Black african	3786 (2.0)	4571 (1.9)
Chinese	684 (0.4)	712 (0.3)
Other	4127 (2.1)	4686 (1.9)
smoking status		
Smoking status recorded	183473 (95.1)	233813 (95.5)
Non smoker	115026 (59.6)	104614 (42.7)
Ex-smoker	39246 (20.3)	79314 (32.4)
Light smoker (1-9/day)	15647 (8.1)	29196 (11.9)
Moderate smoker (10-19/day)	7540 (3.9)	10403 (4.2)
Heavy smoker (20+/day)	6014 (3.1)	10286 (4.2)
Family history and co-morbidity		
Family history premature CHD	29610 (15.4)	32304 (13.2)
Rheumatoid arthritis	7044 (3.7)	4259 (1.7)
Atrial fibrillation	5958 (3.1)	7995 (3.3)
Cardiovascular disease	27861 (14.4)	48516 (19.8)
Treated hypertension	74881 (38.8)	80988 (33.1)
Chronic renal disease	1963 (1.0)	2339 (1.0)
clinical values		
HBA1C recorded	136621 (70.8)	173735 (70.9)

Mean HBA1C mmol/mol (SD)	61.4 (20.8)	63.1 (22.0)
BMI recorded	174049 (90.2)	223360 (91.2)
mean BMI kg/m2 (SD)	31.1 (6.3)	29.8 (5.3)
Cholesterol /HDL ratio recorded	102327 (53.0)	133213 (54.4)
Mean cholesterol /HDL ratio (SD)	4.1 (1.4)	4.5 (1.5)
Systolic blood pressure recorded	187397 (97.1)	237226 (96.9)
Mean systolic blood pressure mmHg (SD)	139.3 (19.9)	138.6 (18.5)

[§] increasing levels of Townsend scores indicating increasing levels of material deprivation.

± includes patients who were either recorded as a white ethnicity or those without any ethnicity recorded

Supplementary Table 2 Distribution of patients in the QResearch derivation cohort and the QResearch and CPRD validation cohorts within 10 geographical regions in England

	QResearch derivation cohort (%)	QResearch validation cohort (%)	CPRD validation cohort (%)
East Midlands	24973 (5.70)	10499 (7.66)	7550 (3.81)
East of England	31500 (7.19)	9435 (6.89)	23052 (11.65)
London	100365 (22.92)	25996 (18.97)	29369 (14.84)
North East	21848 (4.99)	6544 (4.78)	4147 (2.10)
North West	64286 (14.68)	21499 (15.69)	33454 (16.90)
South Central	47991 (10.96)	15201 (11.09)	22154 (11.19)
South East	29267 (6.68)	12466 (9.10)	21372 (10.80)
South West	43598 (9.96)	12710 (9.28)	25281 (12.77)
West Midlands	49921 (11.40)	16849 (12.30)	22174 (11.20)
Yorkshire and Humber	24057 (5.49)	5829 (4.25)	9352 (4.73)

Supplementary table 3 unadjusted hazard ratios with 95% confidence intervals for heart failure in men and women in the derivation cohort.

	<i>Unadjusted Adjusted hazard ratio (95% CI)</i>	
	women¹	men²
age ³	1.08 (1.07 to 1.08)	1.07 (1.07 to 1.07)
Cholesterol/HDL ratio ³	0.99 (0.98 to 1.01)	0.95 (0.94 to 0.96)
Townsend deprivation score ^{3,4}	1.17 (1.13 to 1.20)	1.11 (1.08 to 1.13)
duration of diabetes at baseline		
<1 year	1.06 (1.01 to 1.12)	0.94 (0.90 to 0.98)
1-3 years	1.23 (1.17 to 1.31)	1.25 (1.19 to 1.31)
4-6 years	1.48 (1.40 to 1.57)	1.35 (1.28 to 1.42)
7-10 years	1.51 (1.44 to 1.59)	1.50 (1.44 to 1.57)
≥11 years	1.06 (1.01 to 1.12)	0.94 (0.90 to 0.98)
smoking status		
non-smoker		
Ex-smoker	1.23 (1.18 to 1.29)	1.24 (1.20 to 1.29)
light smoker (1-9/day)	0.95 (0.89 to 1.02)	1.02 (0.97 to 1.07)
moderate smoker (10-19/day)	0.98 (0.89 to 1.08)	0.87 (0.80 to 0.95)
heavy smoker (20+/day)	1.02 (0.92 to 1.13)	0.89 (0.81 to 0.96)
ethnicity		
white/not recorded		
Indian	0.61 (0.53 to 0.69)	0.64 (0.58 to 0.71)
Pakistani	0.62 (0.53 to 0.73)	0.66 (0.58 to 0.77)
Bangladeshi	0.45 (0.37 to 0.53)	0.87 (0.77 to 0.98)
Other Asian	0.51 (0.41 to 0.65)	0.47 (0.38 to 0.57)
Black Caribbean	0.74 (0.66 to 0.85)	0.90 (0.79 to 1.01)
Black African	0.49 (0.39 to 0.62)	0.35 (0.28 to 0.45)
Chinese	0.43 (0.26 to 0.71)	0.33 (0.19 to 0.56)
Other ethnic group	0.60 (0.50 to 0.72)	0.58 (0.49 to 0.69)
co-morbidity		
type 1 diabetes ⁵	0.33 (0.30 to 0.38)	0.35 (0.31 to 0.39)
atrial fibrillation ⁶	4.67 (4.38 to 4.98)	3.92 (3.70 to 4.15)
cardiovascular disease ⁶	3.28 (3.15 to 3.42)	3.41 (3.30 to 3.53)
chronic renal disease ⁶	2.25 (1.93 to 2.61)	2.57 (2.27 to 2.90)

Notes

¹ heart failure model in women included body mass index (2 FP terms -1 -.5), systolic blood pressure (2 FP terms -.5 0), hba1c (2 FP terms -2 -2)

² heart failure model in men included body mass index (2 FP terms -2 0), systolic blood pressure (2 FP terms 0 .5), hba1c (2 FP terms -2 -2)

³ adjusted hazard ratio is per unit increase

⁴ the Townsend deprivation score ranges between -7 (most affluent) and +11 (most deprived).

⁵ adjusted hazard ratio compared with type 2 diabetes

⁶ adjusted hazard ratio compared with patients without the condition at baseline

Supplementary table 4 Codes used to identify patients with chronic renal disease

<i>ReadTerm</i>	<i>ReadDesc</i>
1Z13	Chronic kidney disease stage 4
1Z14	Chronic kidney disease stage 5
1Z1H	Chronic kidney disease stage 4 with proteinuria
1Z1H-1	CKD stage 4 with proteinuria
1Z1J	Chronic kidney disease stage 4 without proteinuria
1Z1J-1	CKD stage 4 without proteinuria
1Z1K	Chronic kidney disease stage 5 with proteinuria
1Z1K-1	CKD stage 5 with proteinuria
1Z1L	Chronic kidney disease stage 5 without proteinuria
1Z1L-1	CKD stage 5 without proteinuria
7B063	Exploration of renal transplant
8L50	Renal transplant planned
K01	Nephrotic syndrome
K010	Nephrotic syndrome with proliferative glomerulonephritis
K011	Nephrotic syndrome with membranous glomerulonephritis
K012	Nephrotic syndrome+membranoproliferative glomerulonephritis
K013	Nephrotic syndrome with minimal change glomerulonephritis
K013-1	Lipoid nephrosis
K013-2	Steroid sensitive nephrotic syndrome
K014	Nephrotic syndrome, minor glomerular abnormality
K015	Nephrotic syndrome, focal and segmental glomerular lesions
K016	Nephrotic syndrome, diffuse membranous glomerulonephritis
K017	Nephrotic syn difus mesangial prolifertiv glomerulonephritis
K018	Nephrotic syn,difus endocapillary prolifitv glomerulonephritis
K019	Nephrotic syn,difuse mesangiocapillary glomerulonephritis
K01A	Nephrotic syndrome, dense deposit disease
K01B	Nephrotic syndrome, diffuse crescentic glomerulonephritis
K01w	Congenital nephrotic syndrome
K01w0	Finnish nephrosis syndrome
K01w0-1	Microcystic type congenital nephrotic syndrome
K01wz	Congenital nephrotic syndrome NOS
K01x	Nephrotic syndrome in diseases EC
K01x0	Nephrotic syndrome in amyloidosis
K01x1	Nephrotic syndrome in diabetes mellitus
K01x1-1	Kimmelstiel - Wilson disease
K01x2	Nephrotic syndrome in malaria
K01x3	Nephrotic syndrome in polyarteritis nodosa
K01x4	Nephrotic syndrome in systemic lupus erythematosus
K01x4-1	Lupus nephritis
K01xz	Nephrotic syndrome in diseases EC NOS
K01y	Nephrotic syndrome with other pathological kidney lesions

K01z	Nephrotic syndrome NOS
K02	Chronic glomerulonephritis
K02-1	Nephritis - chronic
K02-2	Nephropathy - chronic
K020	Chronic proliferative glomerulonephritis
K021	Chronic membranous glomerulonephritis
K022	Chronic membranoproliferative glomerulonephritis
K023	Chronic rapidly progressive glomerulonephritis
K02y	Other chronic glomerulonephritis
K02y0	Chronic glomerulonephritis + diseases EC
K02y1	Chronic exudative glomerulonephritis
K02y2	Chronic focal glomerulonephritis
K02y3	Chronic diffuse glomerulonephritis
K02yz	Other chronic glomerulonephritis NOS
K02z	Chronic glomerulonephritis NOS
K05	Chronic renal failure
K05-1	Chronic uraemia
K05-2	End stage renal failure
K050	End stage renal failure
K100	Chronic pyelonephritis
K1000	Chronic pyelonephritis without medullary necrosis
K1001	Chronic pyelonephritis with medullary necrosis
K1002	Chronic pyelitis
K1003	Chronic pyonephrosis
K1004	Nonobstructive reflux-associated chronic pyelonephritis
K1005	Chronic obstructive pyelonephritis
K1006	Calculous pyelonephritis
K100z	Chronic pyelonephritis NOS
SP083	Kidney transplant failure and rejection
TB001	Kidney transplant with complication, without blame
TB001-1	Renal transplant with complication, without blame
ZV420	[V]Kidney transplanted