SUPPLEMENTARY TABLES

Table A. Cut-off point for age and sex –specific grip strength (kg) quartile.

Sex	Age group	Q1 (Lowest)	Q2	Q3	Q4 (Highest)
Women	<56 years	<21	21-25	26-29	>29
	56 to 65 years	<19	18-22	23-26	>26
	>65 years	<17	17-20	21-24	>24
Men	<56 years	<36	36-42	43-48	>48
	56 to 65 years	<33	33-38	39-44	>44
	>65 years	<31	31-36	37-41	>41

Table B. Grip strength (kg) cut-off points for weakness defined by the Foundation for the National Institutes of Health Sarcopenia Project.

Sex	Normal	Weakness
Women	≥16	<16
Men	≥26	≥26

Table C. Descriptive statistic of grip strength (kg) by age categories and sex.

Age categories	**Women**	**Men**
<45 years	26.8 (6.2)	43.1 (9.3)
45-49 years	25.9 (6.2)	42.2 (9.1)
50-54 years	24.4 (6.1)	40.9 (8.8)
55-59 years	23.0 (6.0)	39.7 (8.5)
60-64 years	21.8 (5.8)	38.0 (8.2)
65-69 years	20.6 (5.7)	35.9 (7.9)
>70 years	19.9 (5.4)	34.4 (7.8)

Data presented as mean and (SD).

Table D Cohort descriptive characteristics by age-specific quartiles of grip strength in women

Socio-demographics	**Q4 (Highest)**	**Q3**	**Q2**	**Q1 (Lowest)**
Total n	62,777	65,338	65,943	66,005
Age (years), mean (SD)	55.4 (8.4)	56.3 (8.0)	56.5 (7.8)	57.1 (7.7)
Deprivation index, mean (SD)	-1.6 (2.9)	-1.5 (2.9)	-1.4 (3.0)	-1.0 (3.2)
Deprivation index quintiles, % (n)				
Lowest	22.0 (13,781)	21.2 (13,763)	20.3 (13,401)	17.6 (11,638)
Lower-Middle	20.9 (13,103)	21.0 (13,744)	10.0 (13,215)	18.7 (12,381)
Middle	20.6 (12,949)	20.7 (13,498)	20.6 (13,524)	19.7 (12,972)
Middle-Higher	19.7 (12,365)	19.9 (13,027)	20.2 (13,324)	21.1 (13,897)
Highest	16.8 (10,579)	17.3 (11,306)	18.9 (12,479)	22.9 (15,117)
Ethnicity, % (n)‡				
Whites	96.1 (60,103)	95.9 (62,525)	95.2 (62,622)	92.4 (60,805)
Mixed background	1.3 (839)	1.4 (904)	1.5 (996)	2.0 (1,341)
South Asians	0.4 (276)	0.9 (590)	1.5 (999)	3.5 (2,274)
Blacks	2.0 (1,277)	1.5 (964)	1.4 (944)	1.6 (1,060)
Chinese	0.2 (126)	0.3 (204)	0.4 (245)	0.5 (312)
Smoking status, % (n)				
Never	58.5 (36,731)	59.4 (38,819)	60.4 (39,858)	60.6 (39,981)
Previous	32.7 (20,542)	32.0 (20,875)	31.1 (20,497)	30.2 (19,898)
Current	8.8 (5,504)	8.6 (5,644)	8.5 (5,588)	9.2 (6,126)
Obesity-related markers				
Height (m), mean (SD)	1.6 (0.1)	1.6 (0.1)	1.6 (0.1)	1.6 (0.1)
BMI, mean (SD)	27.0 (5.1)	26.8 (5.0)	26.9 (5.1)	27.5 (5.5)
BMI Categories, % (n)				
Underweight (<18.5 $kg.m^{-2}$)	0.5 (311)	0.7 (483)	0.8 (538)	1.0 (632)
Normal weight (18.5-<25.0 $kg.m^{-2}$)	39.9 (25,007)	41.1 (26,792)	40.3 (26,543)	35.7 (23,544)
Overweight (25.0 to <30.0 $kg.m^{-2}$)	37.1 (23,308)	36.9 (24,124)	36.5 (24,082)	36.4 (24,016)
Obese (≥30.0 $kg.m^{-2}$)	22.5 (14,151)	21.3 (13,939)	22.4 (14,780)	27.0 (17,813)
Waist Circumference (cm), mean (SD)	84.4 (12.3)	83.9 (12.1)	84.2 (12.4)	85.9 (13.1)
Central Obesity, n (%)	35.2 (22,114)	33.8 (22,085)	34.7 (22,903)	40.4 (26,658)
% Body fat, mean (SD)	36.0 (6.9)	36.2 (6.8)	36.5 (6.8)	37.4 (7.0)
Physical activity				
Grip strength (kg), mean (SD)	30.9 (3.5)	25.4 (2.2)	21.7 (2.0)	15.7 (3.8)
Total physical activity ($MET.min.week^{-1}$), mean (SD)	2,799.6 (2,799.0)	2,684.1 (2,746.9)	2,625.3 (2,743.9)	2,505.6 (2,683.1)
TV viewing ($h.day^{-1}$)	2.6 (1.5)	2.7 (1.5)	2.8 (1.6)	3.0 (1.7)
Total Discretionary sedentary behaviour ($h.day^{-1}$)	4.6 (2.0)	4.6 (2.0)	4.7 (2.0)	4.8 (2.2)
Dietary intakes				
Total energy intake (Kcal.day-1) †	2,052 (604)	2,019 (583)	2,002 (586)	1987 (608)
Protein intake (% of TE) †	15.9 (3.6)	15.9 (3.7)	15.9 (3.7)	15.9 (3.8)
Total fat intake (% of TE) †	32.5 (6.7)	32.2 (6.7)	32.3 (6.8)	32.2 (6.9)
Saturated fat intake (% of TE) †	12.4 (3.3)	12.3 (3.3)	12.3 (3.3)	12.3 (3.4)
Carbohydrate intake (% of TE) †	47.3 (8.0)	47.6 (8.0)	47.7 (8.1)	48.1 (8.2)
Sugar intake (% of TE) †	23.1 (6.9)	23.2 (7.0)	23.2 (7.1)	23.4 (7.4)
Alcohol intake (% of TE), mean (SD) †	4.4 (5.6)	4.3 (5.6)	4.1 (5.5)	3.8 (5.4)
F&V intake ($g.day^{-1}$), mean (SD)	359.1 (189.3)	354.5 (188.9)	348.6 (187.3)	346.5 (197.6)
Processed meat intake ($portion.day^{-1}$), mean (SD)	1.6 (1.0)	1.6 (1.0)	1.6 (1.0)	1.6 (1.0)
Red meat intake ($portion.day^{-1}$), mean (SD)	2.0 (1.4)	2.0 (1.3)	2.0 (1.4)	2.0 (1.4)
Oily fish intake ($portion.day^{-1}$), mean (SD)	1.2 (1.0)	1.1 (1.0)	1.1 (1.0)	1.1 (1.0)
Health status, n (%)				
Diabetes history	2.7 (1,700)	3.1 (2,007)	3.6 (2,397)	5.6 (3,709)
Cancer history	8.0 (5,017)	8.7 (5,699)	9.1 (5,975)	10.2 (6,706)
Long standing illness	23.4 (14,702)	25.7 (16,795)	29.0 (19,090)	41.1 (27,121)
CVD	23.2 (14,540)	23.9 (15,631)	25.0 (16,491)	29.4 (19,429)
Depression history	5.5 (3,427)	6.1 (4,011)	7.0 (4,606)	8.5 (5,577)
Hypertension	21.0 (13,198)	21.4 (13,953)	21.8 (14,378)	24.0 (15,854)

Data presented as mean (SD) or % (n) for continuous and categorical variables as appropriate. CVD: cardiovascular disease; TE: total energy intake; SD: standard deviation; TV: television; BMI: body mass index; MET: metabolic equivalent.
‡ 1527 participants reported to be from "other" or a "mixed ethnic" background. †Data for nutrient intakes were available for a subset of 211 064 participants. **Cut-off points for age- and sex-specific quartiles of grip strength are presented in Table A.**

Table E Cohort descriptive characteristics by age-specific quartiles of grip strength in men

Socio-demographics	**Q4 (Highest)**	**Q3**	**Q2**	**Q1 (Lowest)**
Total n	50,400	55,397	55,496	55,718
Age (years), mean (SD)	56.2 (8.3)	56.8 (8.1)	56.9 (8.3)	57.1 (8.0)
Deprivation index, mean (SD)	-1.8 (2.9)	-1.6 (3.0)	-1.3 (3.1)	-0.6 (3.4)
Deprivation index quintiles, % (n)				
Lowest	23.8 (11,968)	22.0 (12,168)	20.4 (11,313)	16.2 (9,050)
Lower-Middle	22.5 (11,355)	21.2 (11,760)	20.3 (11,262)	17.0 (9,443)
Middle	20.3 (10,241)	20.6 (11,387)	19.9 (11,068)	18.5 (10,301)
Middle-Higher	18.4 (9,247)	10.0 (10,524)	19.7 (10,924)	21.2 (11,813)
Highest	15.0 (7,589)	17.2 (9,558)	29.7 (10,929)	27.1 (15,111)
Ethnicity, % (n) ǂ				
Whites	96.8 (48,614)	96.4 (53,200)	95.3 (52,681)	91.3 (50,596)
Mixed background	1.0 (485)	1.1 (592)	1.2 (668)	1.9 (1,026)
South Asians	0.6 (304)	1.1 (627)	2.0 (1,094)	4.8 (2,665)
Blacks	1.5 (775)	1.2 (676)	1.2 (686)	1.6 (928)
Chinese	0.1 (48)	0.2 (105)	0.3 (151)	0.4 (221)
Smoking status, % (n)				
Never	49.1 (24,724)	49.0 (27,162)	49.4 (27,414)	49.5 (27,563)
Previous	39.7 (20,020)	39.2 (21,696)	38.5 (21,377)	36.9 (20,562)
Current	11.2 (5,656)	11.8 (6,539)	12.1 (6,705)	13.6 (7,593)
Obesity-related markers				
Height (m), mean (SD)	1.8 (0.1)	1.8 (0.1)	1.7 (0.1)	1.7 (0.1)
BMI, mean (SD)	28.1 (3.9)	27.7 (4.0)	27.6 (4.2)	27.8 (4.6)
BMI Categories, n (%)				
Underweight (<18.5 $kg.m^{-2}$)	0.1 (23)	0.1 (52)	0.2 (133)	0.5 (310)
Normal weight (18.5-<25.0 $kg.m^{-2}$)	20.3 (10,230)	24.9 (13,792)	27.3 (15,155)	27.4 (15,251)
Overweight (25.0 to <30.0 $kg.m^{-2}$)	52.5 (26,501)	50.9 (28,190)	48.9 (27,106)	45.7 (25,443)
Obese (≥30.0 $kg.m^{-2}$)	27.1 (13,646)	24.1 (13,363)	23.6 (13,102)	26.4 (14,714)
Waist Circumference (cm), mean (SD)	97.3 (10.7)	96.5 (10.9)	96.4 (11.3)	97.3 (12.2)
Central Obesity, % (n)	31.0 (15,642)	29.0 (16,055)	28.7 (15,936)	32.5 (18,124)
% Body fat, mean (SD)	24.8 (5.5)	25.0 (5.7)	25.2 (5.8)	26.0 (6.1)
Physical activity				
Grip strength (kg), mean (SD)	50.4 (5.1)	42.5 (2.9)	37.1 (2.7)	28.7 (5.2)
Total physical activity ($MET.min.week^{-1}$), mean (SD)	3,248.3 (2,410.8)	3,146.6 (3,361.8)	3,052.2 (3,331.6)	2,838.5 (3,283.6)
TV viewing ($h.day^{-1}$)	2.7 (1.5)	2.7 (1.5)	2.8 (1.6)	3.0 (1.8)
Total Discretionary sedentary behaviour ($h.day^{-1}$)	5.5 (2.4)	5.4 (2.4)	5.4 (2.4)	5.4 (2.6)
Dietary intakes				
Total energy intake (Kcal.day-1) †	2,388 (700)	2,352 (692)	2,336 (698)	2,320 (725)
Protein intake (% of TE) †	15.2 (3.4)	15.2 (3.4)	15.1 (3.4)	15.1 (3.6)
Total fat intake (% of TE) †	31.9 (6.6)	31.7 (6.6)	31.7 (6.7)	31.7 (6.8)
Saturated fat intake (% of TE) †	12.3 (3.3)	12.2 (3.3)	12.2 (3.4)	12.2 (3.4)
Carbohydrate intake (% of TE) †	46.3 (8.1)	46.5 (8.1)	46.7 (8.2)	47.1 (8.5)
Sugar intake (% of TE) †	21.6 (6.6)	21.6 (6.7)	21.6 (6.8)	21.8 (7.2)
Alcohol intake (% of TE), mean (SD) †	6.6 (7.2)	6.6 (7.3)	6.5 (7.4)	6.1 (7.5)
F&V intake ($g.day^{-1}$), mean (SD)	307.7 (188.6)	306.3 (192.6)	301.4 (193.4)	298.9 (211.8)
Processed meat intake ($portion.day^{-1}$), mean (SD)	2.2 (1.0)	2.2 (1.0)	2.2 (1.0)	2.2 (1.1)
Red meat intake ($portion.day^{-1}$), mean (SD)	2.3 (1.5)	2.3 (1.5)	2.3 (1.5)	2.3 (1.6)
Oily fish intake ($portion.day^{-1}$), mean (SD)	1.1 (1.1)	1.1 (1.1)	1.1 (1.1)	1.1 (1.1)
Health status, % (n)				
Diabetes history	4.6 (2,310)	5.6 (3,119)	6.8 (3,788)	10.6 (5,881)
Cancer history	5.7 (2,894)	5.8 (3,226)	6.2 (3,445)	6.5 (3,602)
Long standing illness	29.3 (14,789)	32.2 (17,815)	34.9 (19,388)	44.3 (24,682)
CVD	31.3 (15,756)	32.6 (18,035)	34,1 (18,943)	38,6 (21,532)
Depression history	3.1 (1,577)	3.8 (2,079)	4.1 (2,273)	5.5 (3,066)
Hypertension	24.9 (12,547)	25.1 (13,883)	25.6 (14,218)	27.2 (15,160)

Data presented as mean (SD) or % (n) for continuous and categorical variables as appropriate. CVD: cardiovascular disease; TE: total energy intake; SD: standard deviation; TV: television; BMI: body mass index; MET: metabolic equivalent. †Data for nutrients intake were available for a subset of 211,064 participants**. ǂ 1527 participants reported to be from "other" or a "mixed ethnic" background. Cut-off points for age- and sex-specific quartiles of grip strength are presented in Table A.**

Table F. Association of grip strength with all- and cause-specific mortality in women and men

	Women				Men			
	Total N	**Number of deaths**	**HR (95% CI)** by 5-kg lower grip strength.	**P-value**	**Total N**	**Number of deaths**	**HR (95% CI)** by 5-kg lower grip strength.	**P-value**
All-cause								
Model 0	260,063	5,231	1.27 (1.24 to 1.29)	<0.001	217,011	8,091	1.21 (1.20 to 1.23)	<0.001
Model 1	260,063	5,231	1.29 (1.26 to 1.31)	<0.001	217,011	8,091	1.22 (1.21 to 1.24)	<0.001
Model 2	260,063	5,231	1.21 (1.18 to 1.24)	<0.001	217,011	8,091	1.19 (1.17 to 1.20)	<0.001
Model 3	260,063	5,231	1.19 (1.17 to 1.22)	<0.001	217,011	8,091	1.18 (1.16 to 1.19)	<0.001
Model 4	259,240	4,408	1.20 (1.17 to 1.23)	<0.001	215,523	6,603	1.16 (1.15 to 1.17)	<0.001
CVD								
Model 0	251,355	996	1.28 (1.22 to 1.36)	<0.001	198,553	2,037	1.26 (1.23 to 1.30)	<0.001
Model 1	251,355	996	1.29 (1.23 to 1.36)	<0.001	198,553	2,037	1.28 (1.24 to 1.31)	<0.001
Model 2	251,355	996	1.20 (1.14 to 1.27)	<0.001	198,553	2,037	1.24 (1.20 to 1.27)	<0.001
Model 3	251,355	996	1.18 (1.12 to 1.25)	<0.001	198,553	2,037	1.23 (1.20 to 1.27)	<0.001
Model 4	250,624	832	1.19 (1.13 to 1.25)	<0.001	197,420	1,685	1.22 (1.18 to 1.26)	<0.001
Respiratory System								
Model 0	256,312	690	1.47 (1.37 to 1.56)	<0.001	213,065	1,372	1.34 (1.30 to 1.38)	<0.001
Model 1	256,312	690	1.48 (1.39 to 1.57)	<0.001	213,065	1,372	1.33 (1.29 to 1.37)	<0.001
Model 2	256,312	690	1.35 (1.27 to 1.43)	<0.001	213,065	1,372	1.27 (1.23 to 1.32)	<0.001
Model 3	256,312	690	1.32 (1.25 to 1.41)	<0.001	213,065	1,372	1.26 (1.22 to 1.30)	<0.001
Model 4	255,537	603	1.31 (1.22 to 1.40)	<0.001	211,695	1,159	1.24 (1.20 to 1.28)	<0.001
COPD								
Model 0	256,312	100	1.55 (1.29 to 1.78)	<0.001	213,065	230	1.35 (1.17 to 1.21)	<0.001
Model 1	256,312	100	1.52 (1.30 to 1.78)	<0.001	213,065	230	1.33 (1.23 to 1.44)	<0.001
Model 2	256,312	100	1.33 (1.13 to 1.55)	<0.001	213,065	230	1.26 (1.16 to 1.36)	<0.001
Model 3	256,312	100	1.26 (1.07 to 1.48)	0.005	213,065	230	1.23 (1.14 to 1.33)	<0.001
Model 4	255,537	89	1.24 (1.05 to 1.47)	0.01	211,695	196	1.19 (1.09 to 1.30)	<0.001
All cancer								
Model 0	236,666	2,380	1.15 (1.11 to 1.18)	<0.001	203,844	3,358	1.10 (1.07 to 1.15)	<0.001
Model 1	236,666	2,380	1.18 (1.14 to 1.22)	<0.001	203,844	3,358	1.12 (1.10 to 1.15)	<0.001
Model 2	236,666	2,380	1.16 (1.12 to 1.20)	<0.001	203,844	3,358	1.11 (1.08 to 1.13)	<0.001
Model 3	236,666	2,380	1.15 (1.11 to 1.19)	<0.001	203,844	3,358	1.10 (1.08 to 1.13)	<0.001
Model 4	236,187	2,113	1.17 (1.13 to 1.21)	<0.001	202,776	2,920	1.10 (1.07 to 1.13)	<0.001

Colorectal cancer								
Model 0	236,666	225	1.14 (1.02 to 1.26)	0.02	203,844	336	1.14 (1.06 to 1.22)	<0.001
Model 1	236,666	225	1.19 (1.06 to 1.33)	0.002	203,844	336	1.17 (1.09 to 1.26)	<0.001
Model 2	236,666	225	1.18 (1.05 to 1.32)	0.004	203,844	336	1.17 (1.09 to 1.26)	<0.001
Model 3	236,666	225	1.18 (1.05 to 1.32)	0.005	203,844	336	1.18 (1.10 to 1.27)	<0.001
Model 4	236,187	206	1.17 (1.04 to 1.32)	0.001	202,776	295	1.18 (1.09 to 1.27)	<0.001
Lung cancer								
Model 0	236,666	501	1.16 (1.08 to 1.24)	<0.001	203,844	716	1.08 (1.03 to 1.13)	0.001
Model 1	236,666	501	1.16 (1.08 to 1.25)	<0.001	203,844	716	1.09 (1.04 to 1.15)	<0.001
Model 2	236,666	501	1.13 (1.05 to 1.22)	0.001	203,844	716	1.08 (1.02 to 1.13)	0.004
Model 3	236,666	501	1.13 (1.05 to 1.22)	0.001	203,844	716	1.07 (1.02 to 1.12)	0.009
Model 4	236,187	428	1.17 (1.07 to 1.27)	<0.001	202,776	614	1.08 (1.03 to 1.13)	0.001
Breast / Prostate cancer*								
Model 0	236,666	204	1.19 (1.06 to 1.32)	<0.001	203,844	254	1.03 (0.94 to 1.11)	0.58
Model 1	236,666	204	1.24 (1.11 to 1.39)	<0.001	203,844	254	1.06 (0.97 to 1.15)	0.21
Model 2	236,666	204	1.22 (1.09 to 1.37)	0.001	203,844	254	1.06 (0.97 to 1.16)	0.17
Model 3	236,666	204	1.22 (1.09 to 1.37)	0.001	203,844	254	1.06 (0.97 to 1.15)	0.20
Model 4	236,187	191	1.24 (1.10 to 1.39)	<0.001	202,776	238	1.05 (0.96 to 1.15)	0.29

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by 5-kg lower grip strength.

Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.

Model 1 was adjusted as in model 0 and for height

Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness

Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.

*Hazard ratios estimated for Breast cancer for women and Prostate cancer for men.

Table G. Association of grip strength with cause-specific incidence in women and men

	Women				Men			
	Total N	**Number of events**	**HR (95% CI)** by 5-kg lower grip strength	**P-value**	**Total N**	**Number of events**	**HR (95% CI)** by 5-kg lower grip strength	**P-value**
CVD								
Model 0	251,355	11,371	1.16 (1.14 to 1.18)	<0.001	198,553	16,688	1.10 (1.09 to 1.12)	<0.001
Model 1	251,355	11,371	1.20 (1.18 to 1.22)	<0.001	198,553	16,688	1.13 (1.11 to 1.14)	<0.001
Model 2	251,355	11,371	1,15 (1.14 to 1.17)	<0.001	198,553	16,688	1.11 (1.10 to 1.12)	<0.001
Model 3	251,355	11,371	1.15 (1.13 to 1.16)	<0.001	198,553	16,688	1.11 (1.10 to 1.12)	<0.001
Model 4	250,624	11,157	1.15 (1.13 to 1.17)	<0.001	197,420	16,275	1.11 (1.10 to 1.12)	<0.001
Respiratory System								
Model 0	256,312	4,947	1.32 (1.29 to 1.35)	<0.001	213,065	5,595	1.23 (1.21 to 1.25)	<0.001
Model 1	256,312	4,947	1.33 (1.31 to 1.37)	<0.001	213,065	5,595	1.23 (1.21 to 1.26)	<0.001
Model 2	256,312	4,947	1.24 (1.21 to 1.26)	<0.001	213,065	5,595	1.19 (1.17 to 1.21)	<0.001
Model 3	256,312	4,947	1.22 (1.19 to 1.25)	<0.001	213,065	5,595	1.18 (1.16 to 1.20)	<0.001
Model 4	255,537	4,810	1.22 (1.19 to 1.25)	<0.001	211,695	5,295	1.17 (1.15 to 1.19)	<0.001
COPD								
Model 0	256,312	485	1.45 (1.35 to 1.55)	<0.001	213,065	646	1.27 (1.21 to 1.32)	<0.001
Model 1	256,312	485	1,41 (1.31 to 1.51)	<0.001	213,065	646	1.25 (1.19 to 1.31)	<0.001
Model 2	256,312	485	1.24 (1.15 to 1.33)	<0.001	213,065	646	1.18 (1.12 to 1.24)	<0.001
Model 3	256,312	485	1.20 (1.12 to 1.29)	<0.001	213,065	646	1.16 (1.11 to 1.22)	<0.001
Model 4	255,537	473	1.20 (1.12 to 1.29)	<0.001	211,695	604	1.15 (1.09 to 1.21)	<0.001
All cancer								
Model 0	236,666	13,502	1.08 (1.06 to 1.09)	<0.001	203,844	14,202	1.05 (1.04 to 1.06)	<0.001
Model 1	236,666	13,502	1.11 (1.09 to 1.12)	<0.001	203,844	14,202	1.07 (1.06 to 1.08)	<0.001
Model 2	236,666	13,502	1.10 (1.09 to 1.12)	<0.001	203,844	14,202	1.06 (1.05 to 1.08)	<0.001
Model 3	236,666	13,502	1.10 (1.09 to 1.12)	<0.001	203,844	14,202	1.07 (1.05 to 1.08)	<0.001
Model 4	236,187	13,229	1.10 (1.09 to 1.11)	<0.001	202,776	13,754	1.06 (1.05 to 1.07)	<0.001
Colorectal cancer								
Model 0	236,666	1,083	1.05 (1.01 to 1.10)	0.04	203,844	1,528	1.06 (1.03 to 1.10)	<0.001
Model 1	236,666	1,083	1.08 (1.03 to 1.13)	0.004	203,844	1,528	1.07 (1.04 to 1.11)	<0.001
Model 2	236,666	1,083	1.09 (1.03 to 1.14)	0.002	203,844	1,528	1.08 (1.04 to 1.11)	<0.001
Model 3	236,666	1,083	1.08 (1.03 to 1.14)	0.003	203,844	1,528	1.08 (1.05 to 1.12)	<0.001
Model 4	236,187	1,062	1.08 (1.02 to 1.14)	0.007	202,776	1,478	1.08 (1.05 to 1.11)	<0.001

Lung cancer								
Model 0	236,666	779	1.16 (1.08 to 1.24)	<0.001	203,844	962	1.08 (1.03 to 1.13	0.001
Model 1	236,666	779	1.17 (1.10 to 1.24)	<0.001	203,844	962	1.09 (1.04 to 1.13)	<0.001
Model 2	236,666	779	1.13 (1.07 to 1.20)	<0.001	203,844	962	1.07 (1.03 to 1.12)	0.002
Model 3	236,666	779	1.13 (1.07 to 1.20)	<0.001	203,844	962	1.06 (1.02 to 1.11)	0.005
Model 4	236,187	704	1.15 (1.08 to 1.23)	<0.001	202,776	852	1.08 (1.03 to 1.13)	0.001
Breast / Prostate cancer*								
Model 0	236,666	4,352	1.05 (1.02 to 1.08)	<0.001	203,844	3,249	1.01 (1.00 to 1.03)	0.04
Model 1	236,666	4,352	1.09 (1.06 to 1.12)	<0.001	203,844	3,249	1.03 (1.00 to 1.05)	0.03
Model 2	236,666	4,352	1.09 (1.06 to 1.12)	<0.001	203,844	3,249	1.03 (1.01 to 1.06)	0.01
Model 3	236,666	4,352	1.09 (1.06 to 1.12)	<0.001	203,844	3,249	1.04 (1.01 to 1.06)	0.005
Model 4	236,187	4,337	1.09 (1.06 to 1.12)	<0.001	202,776	3,229	1.04 (1.01 to 1.07)	0.008

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by 5-kg lower grip strength.
Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.
Model 1 was adjusted as in model 0 and for height
Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness
Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).
Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.

*Hazard ratios estimated for Breast cancer for women and Prostate cancer for men.

Table H. Association of quartiles of grip strength with all- and cause-specific mortality in women.

	Total N	Number of deaths	Q4 (Highest)	Q3	Q2	Q1 (Lowest)	Trend HR	P-Value
All-cause Mortality								
Model 0	260,063	5,231	1 (Ref)	1.25 (1.16 to 1.37)	1.56 (1.44 to 1.69)	2.04 (1.89 to 2.21)	1.27 (1.24 to 1.30)	<0.001
Model 1	260,063	5,231	1 (Ref)	1.30 (1.19 to 1.41)	1.64 (1.51 to 1.78)	2.18 (2.02 to 2.37)	1.30 (1.26 to 1.33)	<0.001
Model 2	260,063	5,231	1 (Ref)	1.27 (1.16 to 1.38)	1.54 (1.42 to 1.68)	1.84 (1.70 to 2.00)	1.22 (1.19 to 1.25)	<0.001
Model 3	260,063	5,231	1 (Ref)	1.25 (1.15 to 1.36)	1.52 (1.40 to 1.66)	1.78 (1.64 to 1.94)	1.21 (1.18 to 1.24)	<0.001
Model 4	259,240	4,408	1 (Ref)	1.26 (1.15 to 1.38)	1.51 (1.38 to 1.65)	1.81 (1.66 to 1.98)	1.22 (1.18 to 1.25)	<0.001
CVD								
Model 0	251,355	996	1 (Ref)	1.30 (1.07 to 1.58)	1.72 (1.46 to 2.07)	2.08 (1.73 to 2.50)	1.28 (1.21 to 1.35)	<0.001
Model 1	251,355	996	1 (Ref)	1.32 (1.09 to 1.61)	1.76 (1.46 to 2.13)	2.16 (1.79 to 2.60)	1.29 (1.22 to 1.37)	<0.001
Model 2	251,355	996	1 (Ref)	1.29 (1.06 to 1.57)	1.65 (1.37 to 2.00)	1.80 (1.49 to 2.18)	1.21 (1.15 to 1.29)	<0.001
Model 3	251,355	996	1 (Ref)	1.28 (1.05 to 1.56)	1.63 (1.35 to 1.98)	1.71 (1.41 to 2.06)	1.19 (1.13 to 1.27)	<0.001
Model 4	250,624	832	1 (Ref)	1.20 (0.96 to 1.48)	1.55 (1.26 to 1.91)	1.70 (1.39 to 2.09)	1.20 (1.13 to 1.28)	<0.000
Respiratory System								
Model 0	256,312	690	1 (Ref)	1.53 (1.20 to 1.98)	1.93 (1.51 to 2.46)	3.21 (2.55 to 4.04)	1.46 (1.36 to 1.57)	<0.001
Model 1	256,312	690	1 (Ref)	1.55 (1.20 to 1.99)	1.94 (1.52 to 2.49)	3.24 (2.57 to 4.10)	1.47 (1.36 to 1.57)	<0.001
Model 2	256,312	690	1 (Ref)	1.51 (1.17 to 1.94)	1.80 (1.41 to 2.31)	2.58 (2.04 to 3.27)	1.35 (1.26 to 1.45)	<0.001
Model 3	256,312	690	1 (Ref)	1.47 (1.14 to 1.89)	1.75 (1.36 to 2.24)	2.43 (1.91 to 3.08)	1.32 (1.23 to 1.42)	<0.001
Model 4	255,537	603	1 (Ref)	1.47 (1.13 to 1.93)	1.77 (1.36 to 2.31)	2.41 (1.87 to 3.10)	1.32 (1.22 to 1.43)	<0.001
COPD								
Model 0	256,312	100	1 (Ref)	1.68 (0.81 to 3.46)	2.47 (1.24 to 4.91)	4.24 (2.23 to 8.09)	1.60 (1.33 to 1.94)	<0.001
Model 1	256,312	100	1 (Ref)	1.60 (0.77 to 3.30)	2.29 (1.14 to 4.57)	3.80 (1.97 to 7.35)	1.55 (1.28 to 1.89)	<0.001
Model 2	256,312	100	1 (Ref)	1.55 (0.75 to 3.21)	2.04 (1.02 to 4.09)	2.72 (1.40 to 5.28)	1.37 (1.13 to 1.66)	0.001
Model 3	256,312	100	1 (Ref)	1.44 (0.69 to 2.98)	1.84 (0.92 to 3.70)	2.25 (1.15 to 4.40)	1.29 (1.06 to 1.57)	0.01
Model 4	255,537	89	1 (Ref)	1.57 (0.71 to 3.44)	1.99 (0.93 to 4.22)	2.48 (1.20 to 5.12)	1.32 (1.07 to 1.63)	0.009
All cancer								
Model 0	236,666	2,380	1 (Ref)	1.16 (1.03 to 1.30)	1.36 (1.21 to 1.53)	1.55 (1.37 to 1.73)	1.16 (1.12 to 1.20)	<0.001
Model 1	236,666	2,380	1 (Ref)	1.21 (1.07 to 1.36)	1.45 (1.29 to 1.63)	1.68 (1.49 to 1.89)	1.19 (1.15 to 1.23)	<0.001
Model 2	236,666	2,380	1 (Ref)	1.20 (1.07 to 1.35)	1.43 (1.27 to 1.61)	1.61 (1.42 to 1.81)	1.17 (1.13 to 1.22)	<0.001
Model 3	236,666	2,380	1 (Ref)	1.20 (1.06 to 1.34)	1.42 (1.27 to 1.60)	1.58 (1.40 to 1.78)	1.17 (1.12 to 1.21)	<0.001
Model 4	236,187	2,113	1 (Ref)	1.22 (1.07 to 1.38)	1.46 (1.29 to 1.66)	1.63 (1.44 to 1.86)	1.18 (1.13 to 1.23)	<0.001
Colorectal cancer								
Model 0	236,666	225	1 (Ref)	1.25 (0.84 to 1.83)	1.49 (1.01 to 2.18)	1.70 (1.16 to 2.49)	1.19 (1.05 to 1.34)	<0.001
Model 1	236,666	225	1 (Ref)	1.33 (0.90 to 1.96)	1.65 (1.12 to 2.43)	1.96 (1.33 to 2.90)	1.25 (1.11 to 1.41)	<0.001
Model 2	236,666	225	1 (Ref)	1.33 (0.90 to 1.96)	1.64 (1.12 to 2.42)	1.93 (1.30 to 2.86)	1.24 (1.10: 1.40)	0.001

Model 3	236,666	225	1 (Ref)	1.32 (0.90 to 1.96)	1.65 (1.12 to 2.42)	1.91 (1.29 to 2.84)	1.24 (1.10 to 1.40)	0.001
Model 4	236,187	206	1 (Ref)	1.40 (0.93 to 2.11)	1.73 (1.15 to 2.59)	1.94 (1.28 to 2.94)	1.24 (1.09 to 1.41)	0.001
Lung cancer								
Model 0	236,666	501	1 (Ref)	1.47 (1.13 to 1.91)	1.65 (1.26 to 2.13)	1.65 (1.26 to 2.15)	1.16 (1.07 to 1.26)	<0.001
Model 1	236,666	501	1 (Ref)	1.48 (1.14 to 1.93)	1.66 (1.28 to 2.17)	1.67 (1.27 to 2.19)	1.17 (1.08 to 1.27)	<0.001
Model 2	236,666	501	1 (Ref)	1.47 (1.13 to 1.91)	1.63 (1.25 to 2.12)	1.54 (1.17 to 2.03)	1.14 (1.05 to 1.24)	0.002
Model 3	236,666	501	1 (Ref)	1.45 (1.11 to 1.89)	1.62 (1.24 to 2.11)	1.53 (1.16 to 2.01)	1.14 (1.05 to 1.24)	0.002
Model 4	236,187	428	1 (Ref)	1.58 (1.18 to 2.11)	1.75 (1.31 to 2.34)	1.67 (1.23 to 2.25)	1.16 (1.06 to 1.27)	0.001
Breast cancer								
Model 0	236,666	204	1 (Ref)	1.06 (0.71 to 1.57)	0.99 (0.66 to 1.50)	1.61 (1.11 to 2.35)	1.15 (1.02 to 1.31)	0.02
Model 1	236,666	204	1 (Ref)	1.14 (0.77 to 1.68)	1.11 (0.73 to 1.68)	1.88 (1.28 to 2.76)	1.21 (1.07 to 1.38)	0.003
Model 2	236,666	204	1 (Ref)	1.13 (0.76 to 1.68)	1.10 (0.72 to 1.66)	1.80 (1.22 to 2.66)	1.20 (1.05 to 1.36)	0.006
Model 3	236,666	204	1 (Ref)	1.14 (0.77 to 1.69)	1.10 (0.73 to 1.67)	1.80 (1.21 to 2.66)	1.20 (1.05 to 1.36)	0.007
Model 4	236,187	191	1 (Ref)	1.15 (0.78 to 1.72)	0.96 (0.62 to 1.49)	1.81 (1.21 to 2.69)	1.18 (1.03 to 1.35)	0.01

Data presented as adjusted hazard ratio (HR) (95%CI) by age-specific quartiles of grip strength. The highest quartile of grip strength was used as referent category. The Trend HR indicate the change in the HR by one quartile lower grip strength.

Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.

Model 1 was adjusted as in model 0 and for height

Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness

Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.

Table I. Association of quartiles of grip strength with cause-specific incidence in women

	Total N	Number of events	Q4 (Highest)	Q3	Q2	Q1 (Lowest)	Trend HR	P-value
CVD								
Model 0	251,355	11,371	1 (Ref)	1.12 (1.06 to 1.18)	1.61 (1.24 to 1.38)	1.59 (1.51 to 1.68)	1.17 (1.15 to 1.19)	<0.001
Model 1	251,355	11,371	1 (Ref)	1.16 (1.10 to 1.23)	1.40 (1.32 to 1.47)	1.75 (1.66 to 1.85)	1.21 (1.19 to 1.23)	<0.001
Model 2	251,355	11,371	1 (Ref)	1.15 (1.09 to 1.21)	1.35 (1.28 to 1.42)	1.57 (1.49 to 1.66)	1.16 (1.14 to 1.18)	<0.001
Model 3	251,355	11.371	1 (Ref)	1.15 (1.09 to 1.22)	1.35 (1.28 to 1.43)	1.54 (1.46 to 1.63)	1.16 (1.14 to 1.18)	<0.001
Model 4	250,624	11.157	1 (Ref)	1.15 (1.09 to 1.21)	1.35 (1.27 to 1.42)	1.54 (1.46 to 1.63)	1.16 (1.14 to 1.18)	<0.001
Respiratory System								
Model 0	256,312	4,947	1 (Ref)	1.28 (1.17 to 1.39)	1.48 (1.35 to 1.61)	2.36 (2.18 to 2.56)	1.32 (1.30 to 1.37)	<0.001
Model 1	256,312	4,947	1 (Ref)	1.29 (1.18 to 1.41)	1.50 (1.37 to 1.63)	2.41 (2.22 to 2.62)	1.34 (1.30 to 1.37)	<0.001
Model 2	256,312	4,947	1 (Ref)	1.26 (1.15 to 1.38)	1.40 (1.29 to 1.54)	1.98 (1.82 to 2.15)	1.25 (1.22 to 1.28)	<0.001
Model 3	256,312	4,947	1 (Ref)	1.25 (1.14 to 1.37)	1.39 (1.27 to 1.52)	1.91 (1.75 to 2.07)	1.23 (1.20 to 1.27)	<0.001
Model 4	255,537	4,810	1 (Ref)	1.25 (1.14 to 1.37)	1.39 (1.27 to 1.52)	1.90 (1.75 to 2.08)	1.23 (1.20 to 1.27)	<0.001
COPD								
Model 0	256,312	485	1 (Ref)	1.71 (1.23 to 2.36)	2.19 (1.60 to 3.00)	3.69 (2.76 to 4.94)	1.52 (1.39 to 1.65)	<0.001
Model 1	256,312	485	1 (Ref)	1.61 (1.17 to 2.23)	2.01 (1.47 to 2.76)	3.27 (2.42 to 4.40)	1.46 (1.34 to 1.60)	<0.001
Model 2	256,312	485	1 (Ref)	1.57 (1.14 to 2.17)	1.82 (1.33 to 2.50)	2.39 (1.77 to 3.23)	1.30 (1.19 to 1.42)	<0.001
Model 3	256,312	485	1 (Ref)	1.50 (1.08 to 2.08)	1.73 (1.26 to 2.37)	2.15 (1.59 to 2.91)	1.26 (1.15 to 1.38)	<0.001
Model 4	255,537	473	1 (Ref)	1.51 (1.09 to 2.10)	1.76 (1.28 to 2.43)	2.19 (1.61 to 2.98)	1.27 (1.16 to 1.38)	<0.001
All cancer								
Model 0	236,666	13,502	1 (Ref)	1.09 (1.03 to 1.14)	1.15 (1.09 to 1.21)	1.29 (1.22 to 1.35)	1.08 (1.07 to 1.10)	<0.001
Model 1	236,666	13,502	1 (Ref)	1.13 (1.08 to 1.19)	1.22 (1.16 to 1.28)	1.40 (1.33 to 1.47)	1.12 (1.10 to 1.13)	<0.001
Model 2	236,666	13,502	1 (Ref)	1.13 (1.08 to 1.19)	1.22 (1.16 to 1.28)	1.39 (1.32 to 1.46)	1.11 (1.10 to 1.13)	<0.001
Model 3	236,666	13,502	1 (Ref)	1.13 (1.07 to 1.18)	1.22 (1.16 to 1.28)	1.38 (1.31 to 1.45)	1.10 (1.09 to 1.13)	<0.001
Model 4	236,187	13,229	1 (Ref)	1.13 (1.08 to 1.19)	1.22 (1.16 to 1.28)	1.39 (1.32 to 1.46)	1.11 (1.09 to 1.13)	<0.001
Colorectal cancer								
Model 0	236,666	1,083	1 (Ref)	1.21 (1.03 to 1.14)	1.19 (1.01 to 1.42)	1.31 (1.10 to 1.55)	1.08 (1.02 to 1.14)	<0.001
Model 1	236,666	1,083	1 (Ref)	1.28 (1.08 to 1.51)	1.28 (1.08 to 1.53)	1.45 (1.21 to 1.73)	1.12 (1.06 to 1.18)	<0.001
Model 2	236,666	1,083	1 (Ref)	1.28 (1.08 to 1.51)	1.29 (1.08 to 1.54)	1.47 (1.23 to 1.76)	1.12 (1.06 to 1.19)	<0.001
Model 3	236,666	1,083	1 (Ref)	1.28 (1.08 to 1.51)	1.28 (1.08 to 1.53)	1.46 (1.22 to 1.74)	1.12 (1.06 to 1.18)	<0.001
Model 4	236,187	1,062	1 (Ref)	1.29 (1.09 to 1.53)	1.29 (1.08 to 1.54)	1.45 (1.21 to 1.74)	1.12 (1.05 to 1.18)	<0.001
Lung cancer								
Model 0	236,666	779	1 (Ref)	1.41 (1.14 to 1.74)	1.53 (1.23 to 1.88)	1.62 (1.31 to 1.99)	1.15 (1.08 to 1.23)	<0.001
Model 1	236,666	779	1 (Ref)	1.43 (1.15 to 1.77)	1.56 (1.26 to 1.93)	1.67 (1.34 to 2.07)	1.17 (1.09 to 1.25)	<0.001
Model 2	236,666	779	1 (Ref)	1.42 (1.14 to 1.75)	1.52 (1.23 to 1.89)	1.53 (1.23 to 1.91)	1.13 (1.06 to 1.21)	<0.001
Model 3	236,666	779	1 (Ref)	1.40 (1.13 to 1.74)	1.53 (1.23 to 1.89)	1.53 (1.23 to 1.90)	1.13 (1.06 to 1.21)	<0.001

Model 4	236,187	704	1 (Ref)	1.47 (1.18 to 1.85)	1.59 (1.27 to 2.00)	1.61 (1.28 to 2.03)	1.15 (1.07 to 1.23)	<0.001
Breast cancer								
Model 0	236,666	4,352	1 (Ref)	1.03 (0.695 to 1.12)	1.07 (0.98 to 1.16)	1.21 (1.11 to 1.31)	1.06 (1.03 to 1.09)	<0.001
Model 1	236,666	4,352	1 (Ref)	1.09 (1.00 to 1.18)	1.16 (1.07 to 1.26)	1.35 (1.24 to 1.48)	1.10 (1.07 to 1.13)	<0.001
Model 2	236,666	4,352	1 (Ref)	1.09 (1.00 to 1.18)	1.16 (1.07 to 1.27)	1.36 (1.24 to 1.48)	1.10 (1.07 to 1.13)	<0.001
Model 3	236,666	4,352	1 (Ref)	1.09 (1.00 to 1.18)	1.16 (1.07 to 1.27)	1.35 (1.24 to 1.48)	1.10 (1.07 to 1.13)	<0.001
Model 4	236,187	4,337	1 (Ref)	1.09 (1.00 to 1.19)	1.16 (1.06 to 1.26)	1.35 (1.24 to 1.48)	1.10 (1.07 to 1.13)	<0.001

Data presented as adjusted hazard ratio (HR) (95%CI) by age-specific quartiles of grip strength. The highest quartile of grip strength was used as referent category. The Trend HR indicate the change in the HR by one quartile lower grip strength.

Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.

Model 1 was adjusted as in model 0 and for height

Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness

Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.

Table J. Association of quartiles of grip strength with all- and cause-specific mortality in men.

	Total N	Number of deaths	Q4 (Highest)	Q3	Q2	Q1 (Lowest)	Trend HR	P-value
All-cause Mortality								
Model 0	217,011	8,091	1 (Ref)	1.21 (1.12 to 1.29)	1.39 (1.31 to 1.49)	2.11 (1.98 to 2.25)	1.28 (1.25 to 1.31)	<0.001
Model 1	217,011	8,091	1 (Ref)	1.23 (1.15 to 1.32)	1.44 (1.34 to 1.54)	2.20 (2.06 to 2.35)	1.30 (1.27 to 1.33)	<0.001
Model 2	217,011	8,091	1 (Ref)	1.21 (1.13 to 1.30)	1.38 (1.29 to 1.48)	1.97 (1.85 to 2.11)	1.25 (1.23 to 1.28)	<0.001
Model 3	217,011	8,091	1 (Ref)	1.21 (1.13 to 1.30)	1.38 (1.28 to 1.48)	1.91 (1.79 to 2.05)	1.24 (1.21 to 1.27)	<0.001
Model 4	215,523	6,603	1 (Ref)	1.21 (1.12 to 1.31)	1.38 (1.28 to 1.49)	1.86 (1.73 to 2.01)	1.23 (1.20 to 1.26)	<0.001
CVD								
Model 0	198,553	2,037	1 (Ref)	1.39 (1.20 to 1.59)	1.54 (1.33 to 1.77)	2.59 (2.27 to 2.95)	1.36 (1.31 to 1.42)	<0.001
Model 1	198,553	2,037	1 (Ref)	1.41 (1.23 to 1.63)	1.58 (1.37 to 1.82)	2.71 (2.36 to 3.10)	1.38 (1.32 to 1.44)	<0.001
Model 2	198,553	2,037	1 (Ref)	1.39 (1.20 to 1.60)	1.53 (1.32 to 1.76)	2.45 (2.14 to 2.80)	1.33 (1.28 to 1.39)	<0.001
Model 3	198,553	2,037	1 (Ref)	1.41 (1.22 to 1.62)	1.55 (1.34 to 1.79)	2.42 (2.12 to 2.78)	1.32 (1.27 to 1.38)	<0.001
Model 4	197,420	1,685	1 (Ref)	1.37 (1.17 to 1.60)	1.50 (1.28 to 1.75)	2.33 (2.01 to 2.71)	1.31 (1.25 to 1.37)	<0.001
Respiratory System								
Model 0	213,065	1,372	1 (Ref)	1.43 (1.18 to 1.72)	1.99 (1.67 to 2.38)	3.23 (2.73 to 3.83)	1.48 (1.41 to 1.56)	<0.001
Model 1	213,065	1,372	1 (Ref)	1.40 (1.16 to 1.70)	1.94 (1.62 to 2.33)	3.11 (2.61 to 3.71)	1.47 (1.39 to 1.55)	<0.001
Model 2	213,065	1,372	1 (Ref)	1.38 (1.14 to 1.66)	1.85 (1.54 to 2.22)	2.73 (2.29 to 3.26)	1.40 (1.33 to 1.48)	<0.001
Model 3	213,065	1,372	1 (Ref)	1.34 (1.11 to 1.63)	1.80 (1.50 to 2.16)	2.58 (2.16 to 3.08)	1.38 (1.30 to 1.45)	<0.001
Model 4	211,695	1,159	1 (Ref)	1.33 (1.09 to 1.64)	1.80 (1.48 to 2.19)	2.53 (2.09 to 3.07)	1.37 (1.29 to 1.45)	<0.001
COPD								
Model 0	213,065	230	1 (Ref)	1.08 (0.66 to 1.75)	1.77 (1.15 to 2.73)	3.02 (2.01 to 4.54)	1.51 (1.33 to 1.75)	<0.001
Model 1	213,065	230	1 (Ref)	1.03 (0.63 to 1.67)	1.63 (1.05 to 2.54)	2.70 (1.77 to 4.10)	1.46 (1.28 to 1.67)	<0.001
Model 2	213,065	230	1 (Ref)	1.01 (0.62 to 1.63)	1.52 (0.97 to 2.35)	2.25 (1.47 to 3.42)	1.36 (1.20 to 1.56)	<0.001
Model 3	213,065	230	1 (Ref)	0.97 (0.60 to 1.57)	1.47 (0.95 to 2.29)	2.03 (1.32 to 3.10)	1.32 (1.16 to 1.51)	<0.001
Model 4	211,695	196	1 (Ref)	1.06 (0.64 to 1.75)	1.34 (0.83 to 2.15)	1.96 (1.25 to 3.09)	1.28 (1.11 to 1.48)	0.001
All cancer								
Model 0	203,844	3,358	1 (Ref)	1.10 (1.00 to 1.21)	1.17 (1.06 to 1.29)	1.48 (1.34 to 1.63)	1.13 (1.10 to 1.17)	<0.001
Model 1	203,844	3,358	1 (Ref)	1.15 (1.04 to 1.28)	1.25 (1.13 to 1.39)	1.63 (1.48 to 1.81)	1.17 (1.13 to 1.21)	<0.001
Model 2	203,844	3,358	1 (Ref)	1.15 (1.04 to 1.27)	1.24 (1.12 to 1.37)	1.58 (1.42 to 1.74)	1.16 (1.12 to 1.20)	<0.001
Model 3	203,844	3,358	1 (Ref)	1.16 (1.04 to 1.28)	1.24 (1.12 to 1.38)	1.56 (1.41 to 1.73)	1.15 (1.12 to 1.19)	<0.001
Model 4	202,776	2,920	1 (Ref)	1.18 (1.06 to 1.31)	1.26 (1.13 to 1.40)	1.55 (1.39 to 1.73)	1.15 (1.11 to 1.19)	<0.001
Colorectal cancer								
Model 0	203,844	336	1 (Ref)	1.15 (0.83 to 1.59)	1.42 (1.04 to 1.94)	1.59 (1.16 to 2.18)	1.17 (1.06 to 1.29)	<0.001
Model 1	203,844	336	1 (Ref)	1.23 (0.89 to 1.70)	1.56 (1.14 to 2.15)	1.83 (1.32 to 2.53)	1.23 (1.11 to 1.36)	<0.001
Model 2	203,844	336	1 (Ref)	1.23 (0.89 to 1.70)	1.56 (1.13 to 2.14)	1.80 (1.30 to 2.50)	1.22 (1.10 to 1.35)	<0.001

Model 3	203,844	336	1 (Ref)	1.26 (0.91 to 1.74)	1.59 (1.16 to 2.19)	1.85 (1.34 to 2.58)	1.23 (1.11 to 1.36)	<0.001
Model 4	202,776	295	1 (Ref)	1.21 (0.86 to 1.71)	1.58 (1.13 to 2.22)	1.77 (1.25 to 2.51)	1.22 (1.09 to 1.36)	<0.001
Lung cancer								
Model 0	203,844	716	1 (Ref)	1.08 (0.87 to 1.35)	1.12 (0.90 to 1.40)	1.51 (1.22 to 1.86)	1.14 (1.07 to 1.22)	<0.001
Model 1	203,844	716	1 (Ref)	1.11 (0.89 to 1.39)	1.18 (0.94 to 1.47)	1.61 (1.29 to 2.00)	1.17 (1.09 to 1.25)	<0.001
Model 2	203,844	716	1 (Ref)	1.11 (0.89 to 1.38)	1.16 (0.92 to 1.44)	1.52 (1.22 to 1.89)	1.14 (1.07 to 1.23)	<0.001
Model 3	203,844	716	1 (Ref)	1.10 (0.88 to 1.38)	1.15 (0.92 to 1.44)	1.48 (1.18 to 1.84)	1.13 (1.06 to 1.22)	0.001
Model 4	202,776	614	1 (Ref)	1.07 (0.85 to 1.37)	1.17 (0.92 to 1.49)	1.53 (1.20 to 1.94)	1.15 (1.07 to 1.24)	<0.001
Prostate cancer								
Model 0	203,844	254	1 (Ref)	1.14 (0.81 to 1.61)	0.87 (0.60 to 1.26)	1.21 (0.84 to 1.71)	1.02 (0.91 to 1.15)	0.61
Model 1	203,844	254	1 (Ref)	1.22 (0.86 to 1.72)	0.96 (0.66 to 1.40)	1.38 (0.96 to 1.98)	1.07 (0.96 to 1.21)	0.23
Model 2	203,844	254	1 (Ref)	1.22 (0.86 to 1.73)	0.97 (0.67 to 1.41)	1.41 (0.97 to 2.03)	1.08 (0.96 to 1.22)	0.19
Model 3	203,844	254	1 (Ref)	1.22 (0.87 to 1.73)	0.97 (0.67 to 1.42)	1.39 (0.96 to 2.01)	1.08 (0.96 to 1.21)	0.21
Model 4	202, 776	238	1 (Ref)	1.28 (0.90 to 1.82)	0.93 (0.63 to 1.38)	1.41 (0.97 to 2.07)	1.07 (0.95 to 1.21)	0.25

Data presented as adjusted hazard ratio (HR) (95%CI) by age-specific quartiles of grip strength. The highest quartile of grip strength was used as referent category. The Trend HR indicate the change in the HR by one quartile lower grip strength.

Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.

Model 1 was adjusted as in model 0 and for height

Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness

Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.

Table K. Association of quartiles of grip strength with cause-specific incidence in men.

	Total N	Number of events	Q4 (Highest)	Q3	Q2	Q1 (Lowest)	Trend HR	P-value
CVD								
Model 0	198,553	16,688	1 (Ref)	1.08 (1.04 to 1.13)	1.18 (1.13 to 1.24)	1.48 (1.41 to 1.54)	1.14 (1.12 to 1.15)	<0.001
Model 1	198,553	16,688	1 (Ref)	1.13 (1.08 to 1.18)	1.26 (1.20 to 1.31)	1.60 (1.53 to 1.67)	1.17 (1.15 to 1.18)	<0.001
Model 2	198,553	16,688	1 (Ref)	1.11 (1.06 to 1.17)	1.23 (1.18 to 1.29)	1.52 (1.45 to 1.59)	1.15 (1.13 to 1.16)	<0.001
Model 3	198,553	16,688	1 (Ref)	1.14 (1.09 to 1.19)	1.27 (1.21 to 1.33)	1.55 (1.48 to 1.62)	1.15 (1.14 to 1.17)	<0.001
Model 4	197,420	16,275	1 (Ref)	1.13 (1.08 to 1.18)	1.26 (1.21 to 1.32)	1.54 (1.47 to 1.61)	1.15 (1.13 to 1.17)	<0.001
Respiratory System								
Model 0	213,065	5,595	1 (Ref)	1.15 (1.06 to 1.25)	1.44 (1.32 to 1.56)	2.12 (1.96 to 2.30)	1.30 (1.26 to 1.33)	<0.001
Model 1	213,065	5,595	1 (Ref)	1.16 (1.06 to 1.26)	1.45 (1.33 to 1.58)	2.15 (1.98 to 2.33)	1.30 (1.27 to 1.34)	<0.001
Model 2	213,065	5,595	1 (Ref)	1.13 (1.04 to 1.24)	1.39 (1.28 to 1.51)	1.89 (1.75 to 2.05)	1.25 (1.22 to 1.28)	<0.001
Model 3	213,065	5,595	1 (Ref)	1.14 (1.04 to 1.24)	1.39 (1.28 to 1.51)	1.86 (1.72 to 2.02)	1.24 (1.21 to 1.27)	<0.001
Model 4	211,695	5,295	1 (Ref)	1.14 (1.05 to 1.25)	1.40 (1.28 to 1.52)	1.86 (1.71 to 2.02)	1.24 (1.21 to 1.27)	<0.001
COPD								
Model 0	213,065	646	1 (Ref)	1.18 (0.90 to 1.54)	1.63 (1.27 to 2.09)	2.36 (1.86 to 3.00)	1.35 (1.26 to 1.46)	<0.001
Model 1	213,065	646	1 (Ref)	1.13 (0.87 to 1.48)	1.52 (1.18 to 1.96)	2.15 (1.68 to 2.75)	1.32 (1.22 to 1.42)	<0.001
Model 2	213,065	646	1 (Ref)	1.11 (0.85 to 1.45)	1.41 (1.09 to 1.82)	1.79 (1.40 to 2.29)	1.23 (1.14 to 1.33)	<0.001
Model 3	213,065	646	1 (Ref)	1.09 (0.84 to 1.43)	1.42 (1.10 to 1.83)	1.70 (1.32 to 2.18)	1.21 (1.12 to 1.31)	<0.001
Model 4	211,695	604	1 (Ref)	1.14 (0.87 to 1.50)	1.38 (1.06 to 1.80)	1.67 (1.29 to 2.16)	1.19 (1.10 to 1.29)	<0.001
All cancer								
Model 0	203,844	14,202	1 (Ref)	1.08 (1.03 to 1.13)	1.10 (1.05 to 1.16)	1.26 (1.19(1.31)	1.07 (1.06 to 1.09)	<0.001
Model 1	203,844	14,202	1 (Ref)	1.12 (1.07 to 1.17)	1.17 (1.11 to 1.23)	1.36 (1.30 to 1.43)	1.10 (1.09 to 1.12)	<0.001
Model 2	203,844	14,202	1 (Ref)	1.12 (1.06 to 1.17)	1.16 (1.11 to 1.22)	1.35 (1.28 to 1.42)	1.10 (1.08 to 1.12)	<0.001
Model 3	203,844	14,202	1 (Ref)	1.12 (1.07 to 1.18)	1.17 (1.11 to 1.23)	1.35 (1.29 to 1.42)	1.10 (1.08 to 1.12)	<0.001
Model 4	202,776	13,754	1 (Ref)	1.12 (1.07 to 1.18)	1.17 (1.12 to 1.23)	1.35 (1.28 to 1.42)	1.10 (1.08 to 1.12)	<0.001
Colorectal cancer								
Model 0	203,844	1,528	1 (Ref)	1.14 (1.00 to 1.32)	1.18 (1.02 to 1.37)	1.31 (1.13 to 1.52)	1.09 (1.04 to 1.14)	<0.001
Model 1	203,844	1,528	1 (Ref)	1.18 (1.02 to 1.36)	1.23 (1.06 to 1.43)	1.39 (1.19 to 1.62)	1.11 (1.06 to 1.16)	<0.001
Model 2	203,844	1,528	1 (Ref)	1.18 (1.02 to 1.37)	1.23 (1.06 to 1.43)	1.39 (1.20 to 1.62)	1.11 (1.06 to 1.16)	<0.001
Model 3	203,844	1,528	1 (Ref)	1.20 (1.04 to 1.39)	1.26 (1.08 to 1.46)	1.43 (1.23 to 1.67)	1.12 (1.06 to 1.17)	<0.001
Model 4	202,776	1,478	1 (Ref)	1.20 (1.04 to 1.40)	1.26 (1.08 to 1.46)	1.43 (1.23 to 1.67)	1.12 (1.06 to 1.17)	<0.001
Lung cancer								
Model 0	203,844	962	1 (Ref)	1.15 (0.95 to 1.39)	1.10 (0.91 to 1.33)	1.51 (1.26 to 1.81)	1.13 (1.07 to 1.20)	<0.001
Model 1	203,844	962	1 (Ref)	1.18 (0.97 to 1.43)	1.15 (0.94 to 1.39)	1.59 (1.32 to 1.93)	1.15 (1.09 to 1.22)	<0.001
Model 2	203,844	962	1 (Ref)	1.17 (0.96 to 1.41)	1.12 (0.92 to 1.37)	1.51 (1.25 to 1.83)	1.13 (1.06 to 1.20)	<0.001

Model 3	203,844	962	1 (Ref)	1.17 (0.96 to 1.41)	1.12 (0.92 to 1.37)	1.48 (1.22 to 1.79)	1.12 (1.06 to 1.19)	<0.001
Model 4	202,776	852	1 (Ref)	1.16 (0.94 to 1.42)	1.16 (0.94 to 1.43)	1.54 (1.26 to 1.89)	1.14 (1.07 to 1.22)	<0.001
Prostate cancer								
Model 0	203,844	3,249	1 (Ref)	1.07 (0.97 to 1.18)	1.05 (0.95 to 1.15)	1.13 (1.02 to 1.24)	1.03 (1.00 to 1.06)	0.04
Model 1	203,844	3,249	1 (Ref)	1.10 (1.00 to 1.22)	1.10 (0.99 to 1.21)	1.21 (1.09 to 1.34)	1.06 (1.02 to 1.09)	0.001
Model 2	203,844	3,249	1 (Ref)	1.11 (1.00 to 1.22)	1.10 (1.00 to 1.22)	1.23 (1.11 to 1.36)	1.06 (1.03 to 1.10)	<0.001
Model 3	203,844	3,249	1 (Ref)	1.11 (1.00 to 1.22)	1.10 (1.00 to 1.22)	1.24 (1.12 to 1.38)	1.07 (1.03 to 1.10)	<0.001
Model 4	202,776	3,229	1 (Ref)	1.11 (1.01 to 1.23)	1.10 to 1.00 to 1.22)	1.24 (1.12 to 1.38)	1.07 (1.03 to 1.10)	<0.001

Data presented as adjusted hazard ratio (HR) (95%CI) by age-specific quartiles of grip strength. The highest quartile of grip strength was used as referent category. The Trend HR indicate the change in the HR by one quartile lower grip strength.

Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.

Model 1 was adjusted as in model 0 and for height

Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness

Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.

Table L. Association of grip strength with all- and cause-specific mortality by age categories in women and men

	Women			Men		
	Total N	**Number of deaths**	**HR (95% CI)** 5-kg lower grip strength	**Total N**	**Number of deaths**	**HR (95% CI)** 5-kg lower grip strength
All-cause Mortality			$P_{interaction}$ <0.001			$P_{interaction}$ = 0.03
≤55 years	88,367	1,344	1.22 (1.18 to 1.26)	111,904	1,073	1.23 (1.17 to 1.28)
56-65 years	94,079	3,967	1.18 (1.16 to 1.21)	112,939	2,651	1.22 (1.17 to 1.27)
>65 years	34,565	2,780	1.17 (1.14 to 1.20)	35,220	1,507	1.19 (1.15 to 1.23)
CVD			$P_{interaction}$ = 0.79			$P_{interaction}$ <0.001
≤55 years	110,367	168	1.18 (1.05 to 1.33)	85,625	348	1.30 (1.22 to 1.39)
56-65 years	108,522	502	1.17 (1.09, 1.26)	84,352	1,011	1.25 (1.21 to 1.30)
>65 years	32,466	326	1.27 (1.15 to 1.39)	28,576	678	1.19 (1.13 to 1.25)
Respiratory System			$P_{interaction}$ = 0.06			$P_{interaction}$ <0.001
≤55 years	111,048	101	1.42 (1.23 to 1.63)	87,598	161	1.32 (1.21 to 1.44)
56-65 years	110,931	344	1.30 (1.19 to 1.41)	92,046	638	1.31 (1.25 to 1.38)
>65 years	34,333	245	1.35 (1.21 to 1.50)	33,421	573	1.21 (1.15 to 1.28)
COPD			$P_{interaction}$ = 0.88			$P_{interaction}$ = 0.001
≤55 years	111,048	13	1.38 (0.93 to 2.05)	87,598	14	1.46 (1.12 to 1.90)
56-65 years	110,931	51	1.13 (0.91 to 1.41)	92,046	106	1.30 (1.16 to 1.45)
>65 years	34,333	36	1.46 (1.11 to 1.93)	33,421	110	1.15 (1.02 to 1.30)
All cancer			$P_{interaction}$ = 0.03			$P_{interaction}$ = 0.003
≤55 years	105,357	470	1.19 (1.11 to 1.28)	85,784	485	1.14 (1.07 to 1.20)
56-65 years	100,883	1,238	1.18 (1.13 to 1.24)	87,407	1,707	1.13 (1.09 to 1.16)
>65 years	30,426	672	1.15 (1.08 to 1.23)	30,653	1,166	1.11 (1.07 to 1.15)
Colorectal cancer			$P_{interaction}$ = 0.97			$P_{interaction}$ = 0.58
≤55 years	105,357	48	1.15 (0.91 to 1.46)	85,784	71	1.11 (0.94 to 1.32)
56-65 years	100,883	112	1.26 (1.08 to 1.48)	87,407	163	1.19 (1.08 to 1.32)
>65 years	30,426	65	1.11 (0.90 to 1.38)	30,653	102	1.26 (1.11 to 1.43)
Lung cancer			$P_{interaction}$ = 0.14			$P_{interaction}$ = 0.02
≤55 years	105,357	83	1.17 (0.98 to 1.39)	85,784	86	1.12 (0.97 to 1.29)
56-65 years	100,883	288	1.13 (1.02 to 1.24)	87,407	375	1.10 (1.03 to 1.18)
>65 years	30,426	130	1.20 (1.03 to 1.40)	30,653	255	1.05 (0.97 to 1.15)
Breast cancer / Prostate cancer			$P_{interaction}$ = 0.96			$P_{interaction}$ = 0.60
≤55 years	105,357	81	1.20 (1.01 to 1.42)	85,784	15	1.06 (0.72 to 1.55)
56-65 years	100,883	90	1.28 (1.08 to 1.52)	87,407	117	1.09 (0.96 to 1.24)
>65 years	30,426	33	1.19 (0.88 to 1.61)	30,653	122	1.07 (0.95 to 1.21)

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by 5-kg lower grip strength and age categories. Analysis were adjusted for height, age, sex, education qualifications, deprivation index, ethnicity, month of recruitment, depression, diabetes, hypertension, respiratory disease, CVD, cancer, long-standing illness, BMI categories, smoking, physical activity, discretionary sedentary behaviour , dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Table M. Association of grip strength with cause-specific incidence by age categories in women and men

	Women			Men		
	Total N	**Number of events**	**HR (95% CI)**	**Total N**	**Number of events**	**HR (95% CI)**
CVD			$P_{interaction}$ <0.001			$P_{interaction}$ <0.001
≤55 years	110,367	2,808	1.19 (1.15 to 1.22)	85,625	3,914	1.15 (1.12 to 1.17)
56-65 years	108,522	5,759	1.15 (1.13 to 1.18)	84,352	8,559	1.12 (1.11 to 1.14)
>65 years	32,466	2,804	1.15 (1.12 to 1.19)	28,576	4,215	1.11 (1.08 to 1.13)
Respiratory System			$P_{interaction}$ = 0.14			$P_{interaction}$ =0.11
≤55 years	111,048	1,364	1.21 (1.16 to 1.26)	87,598	1,259	1.19 (1.15 to 1.23)
56-65 years	110,931	2,411	1.24 (1.20 to 1.29)	92,046	2,653	1.19 (1.16 to 1.21)
>65 years	34,333	1,172	1.22 (1.16 to 1.28)	33,421	1,683	1.18 (1.15 to 1.22)
COPD			$P_{interaction}$ = 0.05			$P_{interaction}$ = 0.007
≤55 years	111,048	99	1.31 (1.13 to 1.51)	87,598	90	1.24 (1.11 to 1.39)
56-65 years	110,931	255	1.19 (1.08 to 1.32)	92,046	326	1.19 (1.12 to 1.27)
>65 years	34,333	131	1.21 (1.05 to 1.39)	33,421	230	1.13 (1.04 to 1.23)
All cancer			$P_{interaction}$ = 0.001			$P_{interaction}$ <0.001
≤55 years	105,357	3,743	1.13 (1.10 to 1.16)	85,784	2,363	1.10 (1.06 to 1.13)
56-65 years	100,883	6,926	1.11 (1.09 to 1.14)	87,407	7,636	1.08 (1.07 to 1.10)
>65 years	30,426	2,833	1.12 (1.09 to 1.16)	30,653	4,203	1.07 (1.05 to 1.09)
Colorectal cancer			$P_{interaction}$ = 0.32			$P_{interaction}$ = 0.11
≤55 years	105,357	245	1.17 (1.06 to 1.30)	85,784	257	1.09 (1.00 to 1.20)
56-65 years	100,883	552	1.07 (1.00 to 1.15)	87,407	797	1.11 (1.06 to 1.17)
>65 years	30,426	286	1.11 (1.00 to 1.23)	30,653	474	1.08 (1.02 to 1.15)
Lung cancer			$P_{interaction}$ =0.03			$P_{interaction}$ = 0.002
≤55 years	105,357	139	1.17 (1.03 to 1.34)	85,784	115	1.14 (1.01 to 1.28)
56-65 years	100,883	444	1.15 (1.07 to 1.25)	87,407	519	1.11 (1.04 to 1.17)
>65 years	30,426	196	1.14 (1.00 to 1.29)	30,653	328	1.03 (0.96 to 1.11)
Breast cancer / Prostate cancer			$P_{interaction}$ =0.07			$P_{interaction}$ = 0.01
≤55 years	105,357	1,559	1.09 (1.05 to 1.14)	85,784	398	1.08 (1.00 to 1.16)
56-65 years	100,883	2,171	1.10 (1.07 to 1.15)	87,407	1,933	1.06 (1.03 to 1.09)
>65 years	30,426	622	1.09 (1.01 to 1.17)	30,653	918	1.06 (1.01 to 1.11)

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by 5-kg lower grip strength and age categories. Analysis were adjusted for height, age, sex, education qualifications, deprivation index, ethnicity, month of recruitment, depression, diabetes, hypertension, respiratory disease, CVD, cancer, long-standing illness, BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Table N. Association of grip strength with all- and cause-specific mortality by age categories in women and men with landmark analysis

	Women			Men		
	Total N	**Number of deaths**	**HR (95% CI)** 5-kg lower grip strength	**Total N**	**Number of deaths**	**HR (95% CI)** 5-kg lower grip strength
All-cause Mortality			$P_{interaction}$ <0.001			$P_{interaction}$ = 0.03
≤55 years	88,367	1,344	1.22 (1.18 to 1.26)	111,904	1,073	1.23 (1.17 to 1.28)
56-65 years	94,079	3,967	1.18 (1.16 to 1.21)	112,939	2,651	1.19 (1.15 to 1.23)
>65 years	34,565	2,780	1.17 (1.14 to 1.20)	35,220	1,507	1.22 (1.17 to 1.27)
CVD			$P_{interaction}$ = 0.79			$P_{interaction}$ <0.001
≤55 years	110,367	168	1.18 (1.05 to 1.33)	85,625	348	1.30 (1.22 to 1.39)
56-65 years	108,522	502	1.17 (1.09 to 1.26)	84,352	1,011	1.25 (1.21 to 1.30)
>65 years	32,466	326	1.27 (1.15 to 1.39)	28,576	678	1.19 (1.13 to 1.25)
Respiratory System			$P_{interaction}$ = 0.06			$P_{interaction}$ <0.001
≤55 years	111,048	101	1.42 (1.23 to 1.63)	87,598	161	1.32 (1.21 to 1.44)
56-65 years	110,931	344	1.30 (1.19 to 1.41)	92,046	638	1.31 (1.25 to 1.38)
>65 years	34,333	245	1.35 (1.21 to 1.50)	33,421	573	1.21 (1.15 to 1.28)
COPD			$P_{interaction}$ = 0.88			$P_{interaction}$ = 0.001
≤55 years	111,048	13	1.38 (0.93 to 2.05)	87,598	14	1.46 (1.12 to 1.90)
56-65 years	110,931	51	1.13 (0.91 to 1.41)	92,046	106	1.30 (1.16 to 1.45)
>65 years	34,333	36	1.46 (1.11 to 1.93)	33,421	110	1.15 (1.02 to 1.30)
All cancer			$P_{interaction}$ = 0.03			$P_{interaction}$ = 0.003
≤55 years	105,357	470	1.19 (1.11 to 1.28)	85,784	485	1.13 (1.07 to 1.20)
56-65 years	100,883	1,238	1.18 (1.13 to 1.24)	87,407	1,707	1.13 (1.09 to 1.16)
>65 years	30,426	672	1.15 (1.08 to 1.23)	30,653	1,166	1.11 (1.07 to 1.15)
Colorectal cancer			$P_{interaction}$ = 0.97			$P_{interaction}$ = 0.58
≤55 years	105,357	48	1.15 (0.91 to 1.46)	85,784	71	1.11 (0.94 to 1.32)
56-65 years	100,883	112	1.26 (1.08 to 1.48)	87,407	163	1.19 (1.08 to 1.32)
>65 years	30,426	65	1.11 (0.90 to 1.38)	30,653	102	1.26 (1.11 to 1.43)
Lung cancer			$P_{interaction}$ = 0.14			$P_{interaction}$ = 0.02
≤55 years	105,357	83	1.17 (0.98 to 1.39)	85,784	86	1.12 (0.97 to 1.29)
56-65 years	100,883	288	1.13 (1.02 to 1.24)	87,407	375	1.10 (1.03 to 1.18)
>65 years	30,426	130	1.20 (1.03 to 1.40)	30,653	255	1.05 (0.97 to 1.15)
Breast cancer / Prostate cancer			$P_{interaction}$ = 0.96			$P_{interaction}$ = 0.60
≤55 years	105,357	81	1.20 (1.01 to 1.42)	85,784	15	1.06 (0.72 to 1.55)
56-65 years	100,883	90	1.28 (1.08 to 1.52)	87,407	117	1.09 (0.96 to 1.24)
>65 years	30,426	33	1.19 (0.88 to 1.61)	30,653	122	1.07 (0.95 to 1.21)

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by 5-kg lower grip strength and age categories. Analysis were adjusted for height, age, sex, education qualifications, deprivation index, ethnicity, month of recruitment, depression, diabetes, hypertension, respiratory disease, CVD, cancer, long-standing illness, BMI categories, smoking, physical activity, discretionary sedentary behaviour , dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake). Participants who had events that occurred within the first 2 years of follow up were excluded from the analysis.

Table O. Association of grip strength with cause-specific incidence by age categories in women and men with landmark analysis

	Women			Men		
	Total N	**Number of events**	**HR (95% CI)**	**Total N**	**Number of events**	**HR (95% CI)**
CVD			$P_{interaction}$ <0.001			$P_{interaction}$ <0.001
≤55 years	110,367	2,808	1.19 (1.15 to 1.22)	85,625	3,914	1.15 (1.12 to 1.17)
56-65 years	108,522	5,759	1.15 (1.13 to 1.18)	84,352	8,559	1.12 (1.11 to 1.14)
>65 years	32,466	2,804	1.15 (1.12 to 1.19)	28,576	4,215	1.11 (1.08 to 1.13)
Respiratory System			$P_{interaction}$ = 0.14			$P_{interaction}$ =0.11
≤55 years	111,048	1,364	1.21 (1.16 to 1.26)	87,598	1,259	1.19 (1.15 to 1.23)
56-65 years	110,931	2,411	1.24 (1.20 to 1.29)	92,046	2,653	1.19 (1.16 to 1.22)
>65 years	34,333	1,172	1.22 (1.16 to 1.28)	33,421	1,683	1.18 (1.15 to 1.22)
COPD			$P_{interaction}$ = 0.05			$P_{interaction}$ = 0.007
≤55 years	111,048	99	1.31 (1.13 to 1.51)	87,598	90	1.24 (1.11 to 1.39)
56-65 years	110,931	255	1.19 (1.08 to 1.32)	92,046	326	1.19 (1.12 to 1.27)
>65 years	34,333	131	1.21 (1.05 to 1.39)	33,421	230	1.13 (1.04 to 1.23)
All cancer			$P_{interaction}$ = 0.001			$P_{interaction}$ <0.001
≤55 years	105,357	3,743	1.13 (1.10 to 1.16)	85,784	2,363	1.10 (1.06 to 1.13)
56-65 years	100,883	6,926	1.11 (1.09 to 1.14)	87,407	7,636	1.08 (1.07 to 1.10)
>65 years	30,426	2,833	1.12 (1.09 to 1.16)	30,653	4,203	1.07 (1.05 to 1.09)
Colorectal cancer			$P_{interaction}$ = 0.32			$P_{interaction}$ = 0.11
≤55 years	105,357	245	1.17 (1.06 to 1.30)	85,784	257	1.09 (1.00 to 1.20)
56-65 years	100,883	552	1.07 (1.00 to 1.15)	87,407	797	1.11 (1.06 to 1.17)
>65 years	30,426	286	1.11 (1.00 to 1.23)	30,653	474	1.08 (1.02 to 1.15)
Lung cancer			$P_{interaction}$ =0.03			$P_{interaction}$ = 0.002
≤55 years	105,357	139	1.17 (1.03 to 1.34)	85,784	115	1.14 (1.01 to 1.28)
56-65 years	100,883	444	1.15 (1.07 to 1.25)	87,407	519	1.11 (1.04 to 1.17)
>65 years	30,426	196	1.14 (1.00 to 1.29)	30,653	328	1.03 (0.96 to 1.11)
Breast cancer / Prostate cancer			$P_{interaction}$ =0.08			$P_{interaction}$ = <0.001
≤55 years	105,357	1,559	1.09 (1.05 to 1.14)	85,784	398	1.08 (1.00 to 1.16)
56-65 years	100,883	2,171	1.10 (1.07 to 1.15)	87,407	1,933	1.06 (1.03 to 1.09)
>65 years	30,426	622	1.09 (1.01 to 1.17)	30,653	918	1.06 (1.01 to 1.11)

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by 5-kg lower grip strength and age categories. Analysis were adjusted for height, age, sex, education qualifications, deprivation index, ethnicity, month of recruitment, depression, diabetes, hypertension, respiratory disease, CVD, cancer, long-standing illness, BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake). Participants who had events that occurred within the first 2 years of follow up were excluded from the analysis.

Table P. Association of grip strength with all- and cause-specific mortality in women and men by FNIH Sarcopenia cut-off points for strength weakness

	Women				Men			
	Total N	**Number of deaths**	**HR (95% CI)**	**P-value**	**Total N**	**Number of deaths**	**HR (95% CI)**	**P-value**
All-cause								
Model 0	260,063	5,231	1.66 (1.55 to 1.78)	<0.001	217,011	8,091	2.08 (1.95 to 2.22)	<0.001
Model 1	260,063	5,231	1.67 (1.55 to 1.79)	<0.001	217,011	8,091	2.07 (1.93 to 2.20)	<0.001
Model 2	260,063	5,231	1.39 (1.29 to 1.50)	<0.001	217,011	8,091	1.80 (1.69 to 1.93)	<0.001
Model 3	260,063	5,231	1.36 (1.26 to 1.47)	<0.001	217,011	8,091	1.73 (1.62 to 1.86)	<0.001
Model 4	259,240	4,408	1.39 (1.28 to 1.51)	<0.001	215,523	6,603	1.67 (1.54 to 1.81)	<0.001
CVD								
Model 0	251,355	996	1.73 (1.47 to 2.02)	<0.001	198,553	2,037	2.35 (2.07 to 2.67)	<0.001
Model 1	251,355	996	1.71 (1.45 to 2.01)	<0.001	198,553	2,037	2.33 (2.04 to 2.65)	<0.001
Model 2	251,355	996	1.41 (1.19 to 1.67)	<0.001	198,553	2,037	2.04 (1.78 to 2.33)	<0.001
Model 3	251,355	996	1.36 (1.15 to 1.62)	<0.001	198,553	2,037	1.95 (1.71 to 2.24)	<0.001
Model 4	250,624	832	1.44 (1.20 to 1.72)	<0.001	197,420	1,685	1.84 (1.58 to 2.14)	<0.001
Respiratory System								
Model 0	256,312	690	2.43 (2.04 to 2.90)	<0.001	213,065	1,372	2.66 (2.30 to 2.92)	<0.001
Model 1	256,312	690	2.40 (2.00 to 2.87)	<0.001	213,065	1,372	2.52 (2.17 to 2.92)	<0.001
Model 2	256,312	690	1.86 (1.55 to 2.23)	<0.001	213,065	1,372	2.14 (1.84 to 2.49)	<0.001
Model 3	256,312	690	1.80 (1.50 to 2.16)	<0.001	213,065	1,372	2.03 (1.75 to 2.37)	<0.001
Model 4	255,537	603	1.73 (1.42 to 2.10)	<0.001	211,695	1,159	1.89 (1.60 to 2.24)	<0.001
COPD								
Model 0	256,312	100	2.67 (1.70 to 4.18)	<0.001	213,065	230	2.52 (1.79 to 3.24)	<0.001
Model 1	256,312	100	2.43 (1.54 to 3.84)	<0.001	213,065	230	2.28 (1.61 to 3.24)	<0.001
Model 2	256,312	100	1.70 (1.07 to 2.69)	0.02	213,065	230	1.85 (1.30 to 2.63)	<0.001
Model 3	256,312	100	1.56 (1.03 to 2.46)	0.01	213,065	230	1.67 (1.17 to 2.38)	<0.001
Model 4	255,537	89	1.46 (1.02 to 2.09)	0.04	211,695	196	1.43 (1.01 to 2.02)	0.05
All cancer								
Model 0	236,666	2,380	1.23 (1.09 to 1.39)	<0.001	203,844	3,358	1.49 (1.28 to 1.63)	<0.001
Model 1	236,666	2,380	1.28 (1.13 to 1.44)	<0.001	203,844	3,358	1.51 (1.34 to 1.71)	<0.001
Model 2	236,666	2,380	1.20 (1.07 to 1.36)	0.002	203,844	3,358	1.44 (1.27 to 1.62)	<0.001
Model 3	236,666	2,380	1.18 (1.05 to 1.34)	0.007	203,844	3,358	1.39 (1.18 to 1.53)	<0.001
Model 4	236,187	2,113	1.22 (1.07 to 1.39)	0.003	202,776	2,920	1.34 (1.17 to 1.54)	<0.001
Colorectal cancer								
Model 0	236,666	225	1.17 (0.78 to 1.76)	0.44	203,844	336	1.83 (1.27 to 2.63)	0.001
Model 1	236,666	225	1.25 (0.83 to 1.89)	0.27	203,844	336	1.96 (1.35 to 2.83)	<0.001
Model 2	236,666	225	1.21 (0.80 to 1.84)	0.35	203,844	336	1.91 (1.32 to 2.77)	0.001
Model 3	236,666	225	1.19 (0.79 to 1.81)	0.39	203,844	336	1.95 (1.34 to 2.83)	<0.001
Model 4	236,187	206	1.14 (0.73 to 1.78)	0.56	202,776	295	2.06 (1.39 to 3.06)	<0.001
Lung cancer								
Model 0	236,666	501	1.05 (0.78 to 1.37)	0.74	203,844	716	1.35 (1.05 to 1.75)	0.02
Model 1	236,666	501	1.03 (0.78 to 1.36)	0.80	203,844	716	1.39 (1.07 to 1.80)	0.01
Model 2	236,666	501	0.94 (0.71 to 1.23)	0.65	203,844	716	1.29 (1.01 to 1.65)	0.05
Model 3	236,666	501	0.92 (0.70 to 1.22)	0.61	203,844	716	1.23 (0.94 to 1.59)	0.12
Model 4	236,187	428	1.05 (0.78 to 1.41)	0.74	202,776	614	1.21 (0.91 to 1.61)	0.19
Breast / Prostate cancer*								
Model 0	236,666	204	1.52 (1.00 to 2.31)	0.05	203,844	254	1.10 (0.68 to 1.77)	0.68
Model 1	236,666	204	1.65 (1.08 to 2.52)	0.02	203,844	254	1.18 (0.73 to 1.91)	0.47
Model 2	236,666	204	1.55 (1.01 to 2.39)	0.04	203,844	254	1.22 (0.75 to 1.97)	0.51
Model 3	236,666	204	1.54 (1.00 to 2.36)	0.05	203,844	254	1.18 (0.73 to 1.91)	0.49
Model 4	236,187	191	1.61 (1.02 to 2.53)	0.03	202,776	238	1.13 (0.68 to 1.88)	0.63

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by FNIH Sarcopenia cut-off points (reference groups' ≥26.0 kg and 16.0 kg for men and women, respectively).
Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.
Model 1 was adjusted as in model 0 and for height
Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness
Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).
Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.
*Hazard ratios estimated for Breast cancer for women and Prostate cancer for men.

Table Q. Association of grip strength with cause-specific incidence in women and men by FNIH Sarcopenia cut-off points for strength weakness

	Women				Men			
	Total N	**Number of events**	**HR (95% CI)**	**P-value**	**Total N**	**Number of events**	**HR (95% CI)**	**P-value**
CVD								
Model 0	251,355	11,371	1.44 (1.37 to 1.52)	<0.001	198,553	16,688	1.45 (1.37 to 1.54)	<0.001
Model 1	251,355	11,371	1.50 (1.43 to 1.58)	<0.001	198,553	16,688	1.51 (1.42 to 1.59)	<0.000
Model 2	251,355	11,371	1.33 (1.26 to 1.40)	<0.001	198,553	16,688	1.40 (1.32 to 1.48)	<0.001
Model 3	251,355	11,371	1.30 (1.23 to 1.36)	<0.001	198,553	16,688	1.38 (1.30 to 1.47)	<0.001
Model 4	250,624	11,157	1.30 (1.23 to 1.38)	<0.001	197,420	16,275	1.36 (1.28 to 1.44)	<0.001
Respiratory System								
Model 0	256,312	4,947	2.13 (1.98 to 2.28)	<0.001	213,065	5,595	2.15 (1.98 to 2.33)	<0.001
Model 1	256,312	4,947	1.69 (1.57 to 1.82)	<0.001	213,065	5,595	2.12 (1.95 to 2.30)	<0.001
Model 2	256,312	4,947	1.63 (1.52 to 1.76)	<0.001	213,065	5,595	1.79 (1.65 to 1.94)	<0.001
Model 3	256,312	4,947	1.63 (1.51 to 1.75)	<0.001	213,065	5,595	1.73 (1.59 to 1.88)	<0.001
Model 4	255,537	4,810	1.62 (1.50 to 1.74)	<0.001	211,695	5,295	1.69 (1.55 to 1.84)	<0.001
COPD								
Model 0	256,312	485	2.37 (1.93 to 2.93)	<0.001	213,065	646	2.14 (1.72 to 2.66)	<0.001
Model 1	256,312	485	2.15 (1.74 to 2.66)	<0.001	213,065	646	1.98 (1.28 to 2.47)	<0.001
Model 2	256,312	485	1.53 (1.24 to 1.90)	<0.001	213,065	646	1.60 (1.28 to 2.00)	<0.001
Model 3	256,312	485	1.47 (1.18 to 1.82)	<0.001	213,065	646	1.49 (1.19 to 1.87)	<0.001
Model 4	255,537	473	1.45 (1.17 to 1.80)	<0.001	211,695	604	1.38 (1.09 to 1.75)	0.008
All cancer								
Model 0	236,666	13,502	1.17 (1.11 to 1.23)	<0.001	203,844	14,202	1.21 (1.13 to 1.29)	<0.001
Model 1	236,666	13,502	1.22 (1.16 to 1.29)	<0.001	203,844	14,202	1.27 (1.19 to 1.35)	<0.001
Model 2	236,666	13,502	1.21 (1.14 to 1.27)	<0.001	203,844	14,202	1.24 (1.16 to 1.32)	<0.001
Model 3	236,666	13,502	1.20 (1.13 to 1.27)	<0.001	203,844	14,202	1.24 (1.16 to 1.33)	<0.001
Model 4	236,187	13,229	1.21 (1.14 to 1.28)	<0.001	202,776	13,754	1.23 (1.15 to 1.31)	<0.001
Colorectal cancer								
Model 0	236,666	1,083	1.06 (0.87 to 1.28)	0.55	203,844	1,528	1.30 (1.07 to 1.57)	<0.001
Model 1	236,666	1,083	1.11 (0.92 to 1.35)	0.26	203,844	1,528	1.33 (1.09 to 1.61)	<0.001
Model 2	236,666	1,083	1.13 (0.93 to 1.37)	0.20	203,844	1,528	1.33 (1.10 to 1.62)	0.004
Model 3	236,666	1,083	1.12 (0.92 to 1.36)	0.25	203,844	1,528	1.36 (1.11 to 1.65)	0.002
Model 4	236,187	1,062	1.11 (0.91 to 1.35)	0.30	202,776	1,478	1.37 (1.12 to 1.67)	0.002
Lung cancer								
Model 0	236,666	779	1.04 (0.79 to 1.37)	0.75	203,844	962	1.36 (1.05 to 1.75)	0.02
Model 1	236,666	779	1.03 (0.78 to 1.36)	0.81	203,844	962	1.39 (1.08 to 1.80)	0.01
Model 2	236,666	779	0.94 (0.71 to 1.23)	0.65	203,844	962	1.29 (1.00 to 1.66)	0.05
Model 3	236,666	779	0.92 (0.70 to 1.22)	0.61	203,844	962	1.23 (0.94 to 1.59)	0.12
Model 4	236,187	704	1.05 (0.78 to 1.41)	0.74	202,776	852	1.21 (0.91 to 1.61)	0.19
Breast / Prostate cancer*								
Model 0	236,666	4,352	1.11 (1.01 to 1.220	0.04	203,844	3,249	1.05 (0.90 to 1.21)	0.53
Model 1	236,666	4,352	1.18 (1.07 to 1.30)	0.001	203,844	3,249	1.08 (0.94 to 1.25)	0.27
Model 2	236,666	4,352	1.17 (1.06 to 1.30)	0.002	203,844	3,249	1.13 (0.98 to 1.28)	0.16
Model 3	236,666	4,352	1.17 (1.06 to 1.30)	0.002	203,844	3,249	1.13 (0.98 to 1.31)	0.09
Model 4	236,187	4,337	1.18 (1.07 to 1.30)	0.001	202,776	3,229	1.12 (0.97 to 1.30)	0.12

Data presented as adjusted hazard ratio (HR) and its 95% confidence interval (95% CI) by FNIH Sarcopenia cut-off points (reference groups' ≥26.0 kg and 16.0 kg for men and women, respectively).

Model 0 was adjusted for, age, education qualifications, deprivation index, ethnicity and month of recruitment.

Model 1 was adjusted as in model 0 and for height

Model 2 was adjusted as in model 1 and for depression, diabetes, hypertension, respiratory disease, CVD, cancer and long-standing illness

Model 3 was adjusted as in model 2 and for BMI categories, smoking, physical activity, discretionary sedentary behaviour, dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake).

Model 4 was adjusted as in model 3 but participants who had events within the first 2 years of follow up were excluded from the analysis.
*Hazard ratios estimated for Breast cancer for women and Prostate cancer for men.

Table R. Comparison of the Cox-proportional hazard ratios for incident CVD and CVD and all-cause mortality associated with handgrip strength, systolic blood pressure and physical activity

	HR (95% CI)	P-value
All-cause mortality		
Handgrip strength	1.52 (1.49 to 1.56)	<0.001
Systolic blood pressure	1.04 (1.01 to 1.07)	0.04
Total physical activity	1.04 (1.02 to 1.06)	0.01
CVD mortality		
Handgrip strength	1.59 (1.45 to 1.75)	<0.001
Systolic blood pressure	1.24 (1.17 to 1.33)	<0.001
Total physical activity	1.05 (1.01 to 1.09)	0.02
CVD incidence		
Handgrip strength	1.29 (1.25 to 1.32)	<0.001
Systolic blood pressure	1.29 (1.25 to 1.32)	<0.001
Total physical activity	0.98 (0.95 to 1.01)	0.06

Data presented as adjusted HR and their 95% CI per 1-SD reduction in handgrip strength (kg), and total physical activity (log MET.min.week^{-1}), and increase in blood pressure (mmHg). Analyses were adjusted for month of recruitment, height, age, sex, deprivation index, ethnicity, comorbidities (depression, diabetes, hypertension, long standing illness, respiratory diseases, cancer and CVD when this was not used as main outcome), BMI categories, smoking, sedentary behaviour, and dietary intake (alcohol, fruit and vegetable, oily fish, red meat and processed meat intake). SD: standard deviation, HR: hazard ratio.