

**Supplementary Table 1: Socio-demographic characteristics of specific multimorbid study pairs**

Groups	HT- DM-	HT+ DM-	HT- DM+	HT & DM	DM- CHD-	DM+ CHD-	DM- CHD+	DM & CHD
N=60,660	n=8649	n=37836	n=4340	n=9735	n=35778	n=10501	n=10807	n=3574
40-49 years	776 (11.0)	4444 (63.2)	946 (13.5)	866 (12.3)	4621 (65.7)	1660 (23.6)	599 (8.5)	152 (2.2)
50-59 years	1730 (13.3)	8140 (62.4)	1135 (8.7)	2043 (15.7)	8202 (62.9)	2645 (20.3)	1668 (12.8)	533 (4.1)
60-69 years	2271 (14.1)	9922 (61.7)	1027 (6.4)	2866 (17.8)	9361 (58.2)	2826 (17.6)	2832 (17.6)	1067 (6.6)
70-79 years	2155 (14.6)	9140 (61.9)	792 (5.4)	2686 (18.2)	7996 (54.1)	2259 (15.3)	3299 (22.3)	1219 (8.3)
80-89 years	1409 (16.7)	5496 (65.3)	364 (4.3)	1152 (13.7)	4822 (57.3)	964 (11.4)	2083 (24.7)	552 (6.6)
90 years and over	308 (23.7)	794 (61.1)	76 (5.8)	122 (9.4)	776 (59.7)	147 (11.3)	326 (25.1)	51 (3.9)
Men	4620 (16.0)	16738 (57.9)	2512 (8.7)	5016 (17.4)	15065 (52.2)	5366 (18.6)	6293 (21.8)	2162 (7.5)
Women	4029 (12.7)	21198 (66.7)	1828 (5.8)	4719 (14.9)	20713 (65.2)	5135 (16.2)	4514 (14.2)	1412 (4.4)
Quartile 1* Least deprived	2005 (13.3)	10038 (66.8)	942 (6.3)	2044 (13.6)	9496 (63.2)	2295 (15.3)	2547 (16.9)	691 (4.6)
Quartile 2	2067 (13.8)	9596 (64.1)	972 (6.5)	2335 (15.6)	9022 (60.3)	2522 (16.8)	2641 (17.6)	785 (5.2)
Quartile 3	2210 (14.8)	9048 (60.7)	1115 (7.5)	2541 (17.0)	8602 (57.7)	2722 (18.3)	2656 (17.8)	934 (6.3)
Quartile 4 Most deprived	2328 (15.0)	9082 (58.7)	1291 (8.3)	2768 (17.9)	8502 (55.0)	2917 (18.9)	2908 (18.8)	1142 (7.4)

\*Deprivation measured using the Index of Multiple Deprivation; HT=hypertension, DM=diabetes mellitus, CHD=coronary heart disease; \*IMD scores available on 60382 patient; figures in brackets are a percentage of each socio-demographic factor; study sample selected by one of six registers (hypertension, diabetes mellitus, coronary heart disease, chronic obstructive pulmonary disease, chronic heart failure and chronic kidney disease)

**Supplementary Table 2: Socio-demographic characteristics of specific multimorbid study pairs**

Groups	DM- CKD-	DM+ CKD-	DM- CKD+	DM & CKD	COPD- CHD-	COPD+ CHD-	COPD- CHD+	CHD & COPD
N=60,660	n=37627	n=11181	n=8958	n=2894	n=40975	n=12526	n=5304	n=1855
40-49 years	5026 (71.5)	1764 (25.1)	194 (2.8)	48 (0.7)	5918 (84.2)	729 (10.4)	363 (5.2)	22 (0.3)
50-59 years	9263 (71.0)	2951 (22.6)	607 (4.7)	227 (1.7)	9822 (75.3)	2022 (15.5)	1025 (7.9)	179 (1.4)
60-69 years	10480 (65.1)	3248 (20.2)	1713 (10.6)	645 (4.0)	10594 (65.9)	3400 (21.1)	1593 (9.9)	499 (3.1)
70-79 years	8073 (54.6)	2278 (15.4)	3222 (21.8)	1200 (8.1)	8760 (59.3)	3808 (25.8)	1495 (10.1)	710 (4.8)
80-89 years	4132 (49.1)	825 (9.8)	2773 (32.9)	691 (8.2)	5032 (59.8)	2226 (26.4)	754 (9.0)	409 (4.9)
90 years and over	653 (50.2)	115 (8.8)	449 (34.5)	83 (6.4)	849 (65.3)	341 (26.2)	74 (5.7)	36 (2.8)
Men	18790 (65.0)	6473 (22.4)	2568 (8.9)	1055 (3.7)	17625 (61.0)	7303 (25.3)	2806 (9.7)	1152 (4.0)
Women	18837 (59.3)	4708 (14.8)	6390 (20.1)	1839 (5.8)	23350 (73.5)	5223 (16.4)	2498 (7.9)	703 (2.2)
Quartile 1* Least deprived	9756 (64.9)	2390 (15.9)	2287 (15.2)	596 (4.0)	10901 (72.5)	2989 (19.9)	890 (5.9)	249 (1.7)
Quartile 2	9416 (62.9)	2655 (17.7)	2247 (15.0)	652 (4.4)	10389 (69.4)	2998 (20.0)	1155 (7.7)	428 (2.9)
Quartile 3	9055 (60.7)	2855 (19.1)	2203 (14.8)	801 (5.4)	9855 (66.1)	3063 (20.5)	1469 (9.8)	527 (3.5)
Quartile 4 Most deprived	9218 (59.6)	3228 (20.9)	2192 (14.2)	831 (5.4)	9655 (62.4)	3406 (22.0)	1764 (11.4)	644 (4.2)

\*Deprivation measured using the Index of Multiple Deprivation; DM=diabetes mellitus, CHD=coronary heart disease, COPD=chronic obstructive pulmonary disease, CKD=chronic kidney disease; \*IMD scores available on 60382 patient; figures in brackets are a percentage of each socio-demographic factor; study sample selected by one of six registers (hypertension, diabetes mellitus, coronary heart disease, chronic obstructive pulmonary disease, chronic heart failure and chronic kidney disease)

**Supplementary Table 3: Socio-demographic characteristics of specific multimorbid study pairs**

Groups	COPD- CHF-	COPD+ CHF-	COPD- CHF+	CHF & COPD	CHF- CKD-	CHF+ CKD-	CHF- CKD+	CHF & CKD
N=60,660	n=50617	n=6405	n=2884	n=754	n=46595	n=10427	n=2213	n=1425
40-49 years	6586 (93.7)	381 (5.4)	61 (0.9)	4 (0.1)	6731 (95.7)	236 (3.4)	59 (0.8)	6 (0.1)
50-59 years	11661 (89.4)	1162 (8.9)	183 (1.4)	42 (0.3)	12038 (92.3)	785 (6.0)	176 (1.3)	49 (0.4)
60-69 years	13504 (83.9)	1952 (12.1)	490 (3.0)	140 (0.9)	13275 (82.5)	2181 (13.6)	453 (2.8)	177 (1.1)
70-79 years	11665 (79.0)	1907 (12.9)	903 (6.1)	298 (2.0)	9638 (65.2)	3934 (26.6)	713 (4.8)	488 (3.3)
80-89 years	6262 (74.4)	927 (11.0)	996 (11.8)	236 (2.8)	4319 (51.3)	2870 (34.1)	638 (7.6)	594 (7.1)
90 years and over	939 (72.2)	76 (5.8)	251 (19.3)	34 (2.6)	594 (45.7)	421 (32.4)	174 (13.4)	111 (8.5)
Men	23623 (81.8)	3531 (12.2)	1305 (4.5)	427 (1.5)	24080 (83.4)	3074 (10.6)	1183 (4.1)	549 (1.9)
Women	26994 (85.0)	2874 (9.0)	1579 (5.0)	327 (1.0)	22515 (70.9)	7353 (23.1)	1030 (3.2)	876 (2.8)
Quartile 1* Least deprived	13244 (88.1)	1030 (6.9)	646 (4.3)	109 (0.7)	11691 (77.8)	2583 (17.2)	455 (3.0)	300 (2.0)
Quartile 2	12700 (84.8)	1412 (9.4)	687 (4.6)	171 (1.1)	11553 (77.2)	2559 (17.1)	518 (3.5)	340 (2.3)
Quartile 3	12157 (81.5)	1791 (12.0)	761 (5.1)	205 (1.4)	11345 (76.1)	2603 (17.5)	565 (3.8)	401 (2.7)
Quartile 4 Most deprived	12283 (79.4)	2143 (13.9)	778 (5.0)	265 (1.7)	11782 (76.2)	2644 (17.1)	664 (4.3)	379 (2.5)

\*Deprivation measured using the Index of Multiple Deprivation; CHD=coronary heart disease, COPD=chronic obstructive pulmonary disease, CHF=chronic heart failure, CKD=chronic kidney disease; \*IMD scores available on 60382 patient; figures in brackets are a percentage of each socio-demographic factor; study sample selected by one of six registers (hypertension, diabetes mellitus, coronary heart disease, chronic obstructive pulmonary disease, chronic heart failure and chronic kidney disease)