

Appendix 1 Weighted demographic characteristics of participants included in analysis and participants excluded due to missing data

parameter	group	Complete data independent variables (n=2604)	Missing data independent variables (n=424)
Female		50.1	48.6
age	40-49	41.7	40.5
	50-59	37.7	28.3
	60-69	18	16.5
	70-79	10.2	10.7
	80+	2.5	3.9
education level	No completed education	92.5	93.1
	Some education	7.5	6.9
marital status	Widowed/divorced/single	25	22.6
	Married/cohabiting	75	77.4
wealth quintile (5 is the most wealthy)	1	19.4	19
	2	19.7	17.9
	3	19.3	23.6
	4	20.8	17.4
	5	20.7	22.1

No significant differences tested using chi-square and tau-b

Appendix table 2 Bivariate associations between demographic characteristics and morbidity domain, number of conditions and morbidity category

Variable	group	Morbidity domain			Number of conditions	More than two conditions		Multimorbidity category	
		NCD (%)	HIV (%)	MH (%)	Median (IQR)	OR (95% CI)	P	Concordant (%)	Discordant (%)
sex	female	52.1	0.8	25.8	1 (0-2)	Referent		12.9	15
	male	45.4†	0.5	16.5*	1 (0-1)*	0.56 (0.48-0.66)	<0.001	10.4*	7.4*
age	Correlation coefficient	0.140*	-0.021	0.244*	0.245*	1.05 (1.04-1.05)	<0.001	0.091*	0.205*
education level completed	Some education	65.8	1.6	22.1	1 (0-2)	Referent		24.1	7
	No completed level	47.4	0.5†	9.3*	1 (0-1)*	0.63 (0.48-0.83)	<0.001	10.7*	11.5†
marital status	married or cohabiting	46	0.6	17.5	1 (0-1)	Referent		10.7	8.3
	widowed, divorced, single	57.2*	0.6	32.1*	1 (0-2)*	2.19 (1.84-2.60)	<0.001	14.4*	19.6*
wealth quintile (five is highest)	5	63.2	1.3	16.8	1 (0-2)	Referent		21.8	11
	4	50.1	0.7	18.7	1 (0-1)	0.55 (0.44-0.70)	<0.001	11	10.2
	3	44.9	0.2	21.8	1 (0-1)	0.51 (0.40-0.66)	<0.001	10	10.1
	2	37.7	0.6	22	1 (0-1)	0.44 (0.34-0.56)	<0.001	8.6	9
	1	47.1	0.1	26.8‡	1 (0-1)‡	0.57 (0.45-0.72)	<0.001	6.4‡	15.3‡

\* p&lt;0.001

† p&lt;0.05

‡ p for trend &lt; 0.005



Appendix 3 Sensitivity analysis only using objective measurements of disease											
Variable	group	Morbidity domain				Number of conditions		Morbidity category			
		NCD		MH		EM (95% CI)	P	Concordant (%)		Discordant (%)	
		OR (95% CI)	P	OR (95% CI)	P			OR (95% CI)	P	OR (95% CI)	P
sex	female	Referent	-	Referent	-	0.93 (0.69-0.84)	-	Referent	-	Referent	-
	male	0.8 (0.68-0.93)	0.005	0.68 (0.56-0.82)	<0.001	0.77 (0.69-0.84)	<0.001	0.62 (0.49-0.79)	0.001	0.57 (0.42-0.76)	<0.001
age		1.03 (1.02-1.04)	<0.001	1.04 (1.03-1.05)	<0.001	0.021* 0.002	<0.001	1.04 (1.03-1.05)	<0.001	1.05 (1.04-1.06)	<0.001
	education level completed	Some education	Referent	Referent	-	0.96 (0.83-1.08)	-	Referent	-	Referent	-
	no completed level	0.48 (0.36-0.63)	<0.001	1.7 (1.08-2.65)	0.02	0.73 (0.69-0.77)	0.001	0.46 (0.32-0.66)	<0.001	0.91 (0.51-1.65)	0.762
marital status	married or cohabiting	Referent	-	Referent	-	0.8 (0.73-0.86)	Referent	Referent	-	Referent	-
	widowed, divorced, separated	1.19 (0.98-1.44)	0.076	1.2 (0.96-1.48)	0.106	0.9 (0.81-0.99)	0.027	1.19 (0.91-1.56)	0.205	1.36 (0.92-1.99)	0.121
wealth quintile (five is highest)	5	Referent		Referent	-	1.02 (0.94-1.10)	-	Referent	-	Referent	-
	4	0.68 (0.54-0.84)	0.001	1.08 (0.81-1.44)	0.604	0.82 (0.73-0.92)	<0.001	0.48 (0.32-0.62)	<0.001	1.05 (0.70-1.60)	0.814
	3	0.55 (0.44-0.69)	<0.001	1.31 (0.98-1.74)	0.067	0.81 (0.72-0.91)	<0.001	0.52 (0.38-0.73)	<0.001	0.92 (0.60-1.42)	0.717
	2	0.41 (0.32-0.51)	<0.001	1.31 (0.99-1.74)	0.061	0.74 (0.65-0.84)	<0.001	0.45 (0.32-0.62)	<0.001	0.81 (0.52-1.26)	0.353
	1	0.6 (0.48-0.75)‡	<0.001	1.36 (1.03-1.80)	0.028	0.83 (0.73-0.92)	<0.001	0.45 (0.32-0.62)	<0.001	1.36 (0.92-1.99)	0.121

\*Beta values with standard errors

Appendix table 4 Multivariable associations between demographic characteristics and multimorbidity (MM) ( $\geq 2$  conditions) in the domains of non-communicable diseases (NCDs), mental health (MH) or both

Variable	group	Morbidity domain					
		MM NCD		MM MH		MM NCD + MH	
		OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
sex	female	Referent	-	Referent	-	Referent	-
	male	0.54 (0.43-0.69)	<0.001	0.92 (0.66-1.30)	0.644	0.53 (0.41-0.69)	<0.001
age		1.03 (1.02-1.04)	<0.001	1.06 (1.04-1.07)	<0.001	1.05 (1.04-1.06)	<0.001
education level completed	Some education	Referent	-	Referent	-	Referent	-
	no completed level	0.38 (0.28-0.53)	<0.001	6.19 (1.26-30.48)	0.025	1.23 (0.70-2.15)	0.467
marital status	married or cohabiting	Referent	-	Referent	-	Referent	-
	widowed, divorced, single	1.09 (0.83-1.43)	0.553	1.32 (0.91-1.92)	0.147	1.25 (0.95-1.64)	0.11
wealth quintile (five is highest)	5	Referent		Referent	-	Referent	-
	4	0.45 (0.33-0.60)	<0.001	1.03 (0.62-1.71)	0.924	0.96 (0.67-1.38)	0.578
	3	0.37 (0.27-0.51)	<0.001	1.16 (0.70-1.93)	0.562	0.97 (0.67-1.40)	0.868
	2	0.23 (0.16-0.33)	<0.001	1.17 (0.71-1.93)	0.543	0.80 (0.55-1.16)	0.242
	1	0.22 (0.16-0.31)‡	<0.001	1.25 (0.78-2.01)	0.359	1.18 (0.84-1.67)	0.334

Appendix table 5 Multivariable analyses of concordant and discordant multimorbidity and frailty, disability, quality of life and measurements of physical performances

Variable	Group	Frailty or unable		WHO DAS		Quality of life		Time to chair rise		Walk speed		Hand grip strength	
		OR (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P
Sex	Female	Referent	-	15.12 (13.42-17.03)	-	53.11 (53.89-54.33)	-	15.28 (14.87-15.70)	-	0.91 (0.89-0.93)	-	32.45 (31.76-33.15)	-
	Male	1.07 (0.83-1.38)	0.588	11.89 (10.48-13.49)	<0.001	55.06 (53.79-56.34)	<0.001	13.5 (13.12-13.89)	<0.001	1.03 (1.01-1.05)	<0.001	44.77 (44.05-45.50)	<0.001
Age		1.08 (1.07-1.09)	<0.001	0.040* 0.002	<0.001	-0.321* 0.025	<0.001	0.009* 0.001	<0.001	-0.007* 0.001	<0.001	-0.417* 0.014	<0.001
Educational level completed	Some education	Referent	-	11.21 (9.14-13.74)	-	54.8 (52.84-56.76)	-	13.75 (13.16-14.36)	-	1.01 (0.97-1.04)	-	39.77 (38.65-40.88)	-
	No education	0.9 (0.56-1.46)	0.679	16.03 (14.91-17.24)	0.001	53.37 (52.54-54.19)	0.158	15 (14.72-15.29)	<0.001	0.93 (0.92-0.95)	<0.001	37.46 (36.98-37.93)	<0.001
Marital status	Married or cohabiting		-	11.49 (11.14-14.02)	-	54.8 (53.63-55.97)	-	14.1 (13.74-14.47)	-	0.98 (0.96-1.01)	-	38.26 (37.43-39.08)	-
	Widowed, divorced, single	1.19 (0.90-1.56)	0.218	14.39 (12.55-16.50)	0.021	53.37 (51.93-54.82)	0.039	14.62 (14.15-15.11)	0.018	0.96 (0.93-0.98)	0.016	38.97 (38.30-39.63)	0.071
Wealth (quintiles):	5	Referent	-	13.93 (12.25-15.83)	-	58.86 (57.53-60.18)	-	14.72 (14.29-15.16)	-	0.97 (0.95-0.99)	-	40.74 (39.98-41.49)	-
	4	0.8 (0.56-1.13)	0.028	12.88 (11.10-14.95)	0.31	56.36 (54.85-57.87)	0.002	14.19 (13.72-14.68)	0.04	1.01 (0.98-1.03)	0.005	39.09 (38.22-39.95)	<0.001
	3	0.57 (0.39-0.83)	0.004	13.56 (11.63-15.81)	0.731	53.64 (52.07-55.21)	<0.001	14.08 (13.60-14.58)	0.013	0.97 (0.94-1.00)	0.805	38.54 (37.65-39.44)	<0.001
	2	0.94 (0.67-1.33)	0.781	13.45 (11.56-15.66)	0.658	53.31 (51.75-54.87)	<0.001	14.47 (13.98-14.97)	0.335	0.97 (0.94-0.99)	0.87	37.99 (37.10-38.88)	<0.001
	1	1.12 (0.80-1.55)	0.509	13.24 (11.40-15.36)	0.513	48.26 (46.71-49.81)	<0.001	14.35 (13.86-14.86)	0.171	0.94 (0.91-0.96)	0.026	36.71 (35.82-37.60)	<0.001
Multimorbidity category	No multimorbidity	Referent	-	9.09 (8.13-10.17)	-	57.37 (56.30-58.45)	-	14.12 (13.79-14.46)	-	0.99 (0.98-1.01)	-	38.83 (38.22-39.45)	-
	Concordant	1.46 (1.06-2.01)	0.019	15.16 (13.00-17.69)	<0.001	53.48 (51.82-55.14)	<0.001	14.57 (14.04-15.12)	0.082	0.96 (0.93-0.99)	0.023	38.94 (38.00-39.89)	0.109
	Discordant	2.53 (1.91-3.34)	<0.001	17.48 (14.98-20.40)	<0.001	51.4 (49.65-53.15)	<0.001	14.39 (13.82-14.98)	0.324	0.95 (0.92-0.99)	0.006	38.06 (37.05-39.07)	0.814

\*Beta values with standard errors

Appendix 6 Multivariable associations between multimorbidity category and frailty, disability, quality of life and measurements of physical performances after adjusting for number of conditions

Variable	Group	Outcome											
		Frail or unable		Who DAS		Quality of Life		Time to chair rise		Walk speed		Grip strength	
		OR (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P	EM (95% CI)	P
Sex	Female	Referent	-	16.18 (9.96-26.30)	-	48.35 (42.25-54.45)	-	14.42 (12.50-16.64)	-	0.83 (0.72-0.93)	-	29.11 (25.86-32.36)	-
	Male	0.87 (0.55-1.37)	0.557	14.57 (8.89-23.88)	0.645	47.52 (41.33-53.71)	0.543	12.37 (10.71-14.29)	<0.001	0.93 (0.82-1.04)	<0.001	41.22 (37.90-44.54)	<0.001
Age		1.09 (1.07-1.11)	<0.001	0.031* 0.004	<0.001	-0.239* 0.054	<0.001	0.009* 0.001	<0.001	-0.009* 0.001	<0.001	-0.395* 0.028	<0.001
Educational level completed	Some education	Referent	-	13.75 (8.00-23.64)	-	48.29 (41.48-55.10)	-	12.9 (11.03-15.08)	-	0.93 (0.81-1.05)	-	35.87 (32.29-39.45)	-
	No education	0.68 (0.32-1.44)	0.515	17.15 (10.74-27.36)	0.001	47.58 (41.70-53.46)	0.743	13.84 (12.06-14.88)	0.104	0.82 (0.72-0.93)	0.004	34.46 (31.29-37.64)	0.193
Marital status	Married or cohabiting	Referent	-	14.4 (8.83-23.47)	-	48.29 (42.17-54.41)	-	13.01 (11.26-15.03)	-	0.89 (0.79-1.00)	-	35.27 (32.00-38.55)	-
	Widowed, divorced, single	1.08 (0.68-1.72)	0.737	16.4 (10.01-26.79)	0.188	47.59 (41.36-53.81)	0.638	13.72 (11.88-15.84)	0.091	0.86 (0.75-0.97)	0.142	35.06 (31.74-38.38)	0.773
Wealth (quintiles):	5	Referent	-	14.83 (9.70-25.82)	-	55.31 (49.16-61.46)	-	13.76 (11.91-15.89)	-	0.87 (0.76-0.98)	-	37.4 (34.13-40.67)	-
	4	0.62 (0.33-1.17)	0.138	14.55 (8.75-24.17)	0.495	51.93 (45.54-58.33)	0.059	13.23 (11.41-15.35)	0.292	0.91 (0.80-1.02)	0.257	36 (32.57-39.43)	0.125
	3	0.62	0.117	14.99	0.67	47.69	<0.001	13.01	0.147	0.86	0.694	35.07	0.014

		(0.33-1.17)		(9.03-24.87)		(41.14-54.23)		(11.20-15.13)		(0.75-0.98)		(31.60-38.53)	
	2	1.04 (0.57-1.91)	0.889	15.83 (9.42-26.60)	0.997	47.89 (41.24-54.53)	<0.001	13.66 (11.73-15.91)	0.862	0.87 (0.75-0.98)	0.806	34.62 (31.10-38.13)	0.005
	1	1.2 (0.68-2.12)	0.53	15.64 (9.35-26.17)	0.926	36.86 (30.26-43.47)	<0.001	13.13 (11.27-15.30)	0.244	0.87 (0.75-0.98)	0.803	32.75 (29.24-36.26)	0.001
HIV	No	Referent	-	22.66 (19.18-26.77)	-	48.47 (46.15-50.78)		15.15 (14.46-15.88)	-	0.92 (0.88-0.96)	-	35.96 (34.80-37.12)	-
	Yes	0.61 (0.07-5.06)	0.334	10.41 (4.10-26.41)	0.101	47.4 (35.82-58.99)	0.858	11.78 (8.95-11.50)	0.073	0.83 (0.62-1.04)	0.396	34.37 (28.12-40.62)	0.581
Number of conditions	-	1.65 (1.28-2.13)	<0.001	0.181* 0.056	<0.001	-0.239* 0.860	<0.001	0.013* 0.001	0.509	-0.023* 0.015	0.117	-0.280* 0.443	0.527
Multimorbidity (MM) category	MM NCD	Referent	-	12.19 (7.49-19.84)	-	51.56 (45.47-57.65)	-	13.43 (11.64-15.50)	-	0.9 (0.79-1.01)	-	36.69 (33.43-39.94)	-
	MM MH	2.27 (1.18-2.13)	0.002	19.38 (11.53-32.59)	<0.001	42.56 (45.84-49.28)	<0.001	13.48 (11.57-15.70)	0.929	0.83 (0.71-0.95)	0.039	33.61 (30.07-37.14)	0.003
	MM NCD + MH	1.68 (1.05-2.69)	<0.001	15.34 (9.35-25.15)	0.017	49.69 (43.43-55.94)	0.183	13.16 (11.37-15.25)	0.493	0.9 (0.78-1.05)	0.801	35.21 (31.86-38.56)	0.037

\*Beta values with standard errors