SUPPLEMENTARY MATERIALS

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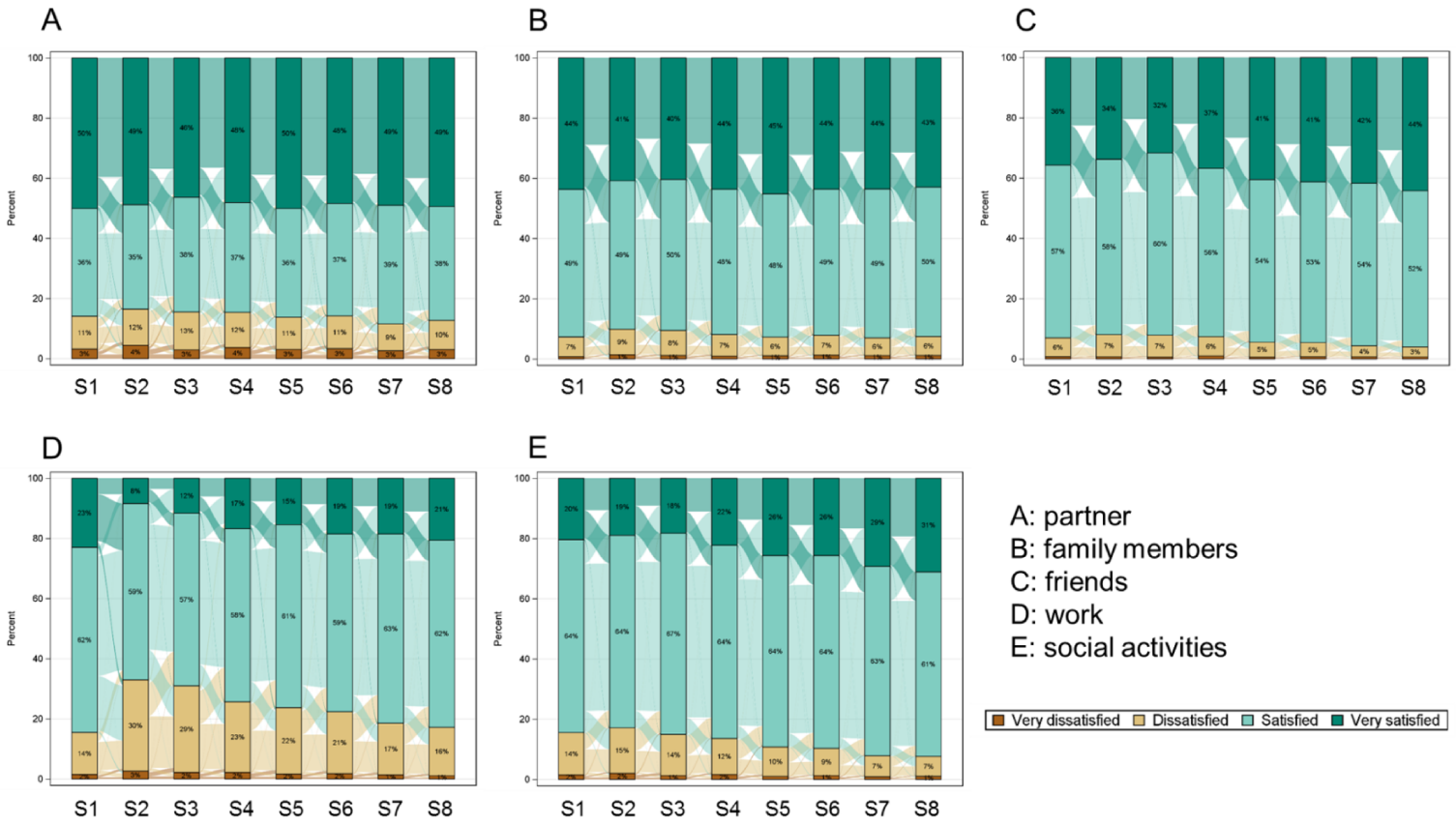

Figure S1. Longitudinal transitions of women in different satisfaction categories of each social relationship component.

The bars with different colours show the distribution of different satisfaction categories at each survey, and the links between bars show the flow from one category to another.

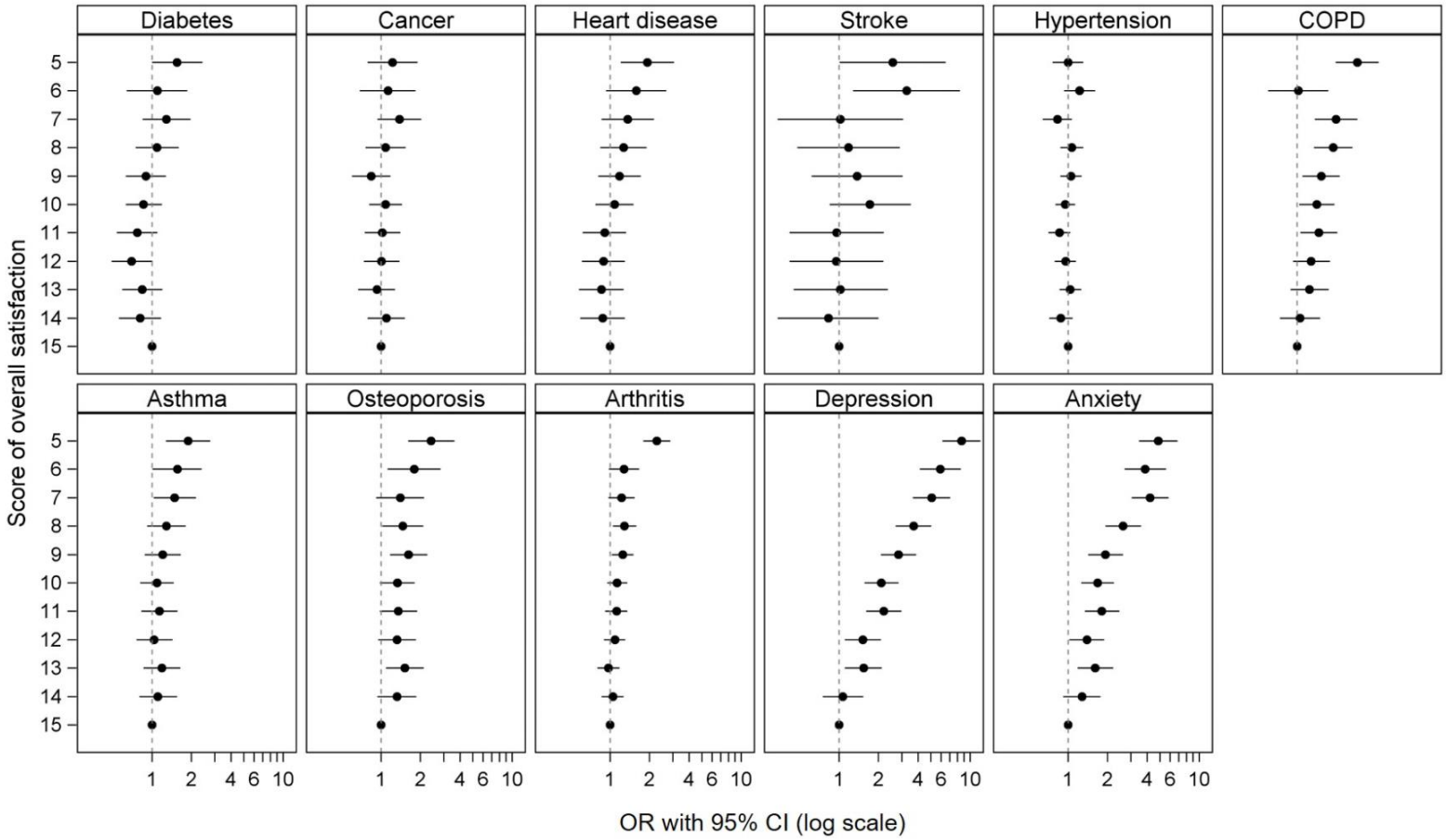

Figure S2. ORs and 95% CI (age-period adjusted) for associations between overall social relationships satisfaction score and incidence of each chronic condition (n=7694).

Table S1. Definitions of covariates.

Covariate	Definition	Source
Sociodemographic Factors		
Country of birth		Baseline
Australia		
Other	Including United Kingdom, Italy, Greece, New Zealand, Vietnam, and others	
Marital status		Each survey
Married/de facto	de facto (opposite sex, same sex)	
Separated/divorced/widowed		
Never married	Single	
Area of residence	Using ARIA+ score to define area of residence *	Each survey
Major cities	0-0.20	
Inner regions	>0.20-2.40	
Outer regions	>2.40-5.92	
Remote/Very remote	Remote Australia >5.92-10.53	
	Very remote Australia>10.53	
Education		Baseline
University/higher degree	University degree, Higher university degree (e.g. Grad Dip, Masters, PhD)	
Trade/apprenticeship/higher	Trade/apprenticeship (e.g. Hairdresser, Chef), Certificate/diploma (e.g. Child Care, Technician)	
Higher school certificate	Higher school or leaving certificate (or equivalent)	
No or low qualifications	No formal qualifications, School or intermediate certificate (or equivalent)	
Ability to manage on income		Each survey

Easy/not bad		
Sometimes difficult		
Impossible/difficult always		
Lifestyle Factors		
BMI	WHO classification	Each survey
Underweight	<18.5 kg/m^2	
Normal weight	18.5-24.9 kg/m^2	
Overweight	25-29.9 kg/m^2	
Obese	≥ 30 kg/m^2	
Physical activity	Using MET min/week to define physical activity †	Each survey
High	≥ 1200 MET min/week	
Moderate	600-1199 MET min/week	
Low	40-599 MET min/week	
Nil/sedentary	0-39 MET min/week	
Alcohol intake	Australian National Health and Medical Research Council guidelines	Each survey
Low risk drinker	up to 14 drinks per week	
Non-drinker/ Rarely drinker		
Risky drinker	more than 15 drinks per week	
Smoking status		Each survey
Never-smoker	Have never smoked	
Ex-smoker	Used to smoke	
Current smoker	Smoke occasionally or regularly	
Menopausal status	Based on the responses to survey questions about hysterectomy, oophorectomy, hormone use and menstrual pattern	Each survey

Surgical menopause	hysterectomy, oophorectomy or both
Hormone use	
Pre-menopausal	
Peri-menopausal	
Post-menopausal	

* ARIA+ (Accessibility/Remoteness Index of Australia) is Australia's most authoritative geographic measure of remoteness based on distances to major population centres (1).

† A physical activity score in metabolic equivalent (MET) minutes per week was derived using the following formula: MET min/week = (walking minutes * 3.5 METs) + (moderate acativity minutes * 4.0 METs) + (vigorous activity minutes * 7.5 METs) (2)

Table S2. Comparison of characteristics of women who were excluded in the analyses versus included women, ALSWH, 1996 (n=13714).

Characteristic	Included (7694)	Excluded (6020)	*p*-value *
Overall satisfaction scores	10.9 ± 2.5	10.3 ± 2.8	<0.001
Age at baseline	47.6 ± 1.5	47.6 ± 1.5	0.211
Area of residence			0.159
Major cities	2802 (36.4)	2197 (36.5)	
Inner regions	2978 (38.7)	2236 (37.2)	
Outer regions	1535 (20.0)	1263 (21.0)	
Remote/very remote	378 (4.9)	322 (5.4)	
Marital status			< 0.001
Married	6563 (85.6)	4748 (79.4)	
Separated/divorced/widowed	894 (11.7)	996 (16.7)	
Single	211 (2.8)	234 (3.9)	
Education			< 0.001
University/Higher degree	1098 (14.4)	794 (13.4)	
Trade/apprenticeship/diploma	1550 (20.3)	1049 (17.7)	
High school certificate	1292 (16.9)	994 (16.7)	
No qualifications	3695 (48.4)	3104 (52.3)	
Country of birth			0.797
Australia	5800 (76.2)	4505 (76.0)	
Outside Australia	1813 (23.8)	1423 (24.0)	
Ability to manage on income			<0.001
Easy/not bad	4639 (60.5)	3038 (51.0)	
Sometime difficult	2079 (27.1)	1842 (30.9)	
Impossible/difficult always	949 (12.4)	1081 (18.1)	
BMI categories			<0.001
Underweight (< 18.5 kg/m^2)	119 (1.6)	116 (2.0)	
Normal weight (18.5-24.9 kg/m^2)	3969 (53.3)	2696 (46.9)	
Overweight (25-29.9 kg/m^2)	2137 (28.7)	1677 (29.2)	
Obese (30-35 kg/m^2)	1217 (16.4)	1257 (21.9)	
Physical activity			<0.001
High (≥ 1200 MET min/week)	1278 (16.7)	949 (15.9)	
Moderate (600-1199 MET min/week)	2006 (26.3)	1456 (24.4)	
Low (40-599 MET min/week)	2346 (30.7)	1814 (30.4)	
Nil/sedentary (0-39 MET min/week)	2010 (26.3)	1748 (29.3)	

Alcohol intake			<0.001
Low risk	3912 (51.2)	2620 (44.1)	
Non/rarely	3357 (43.9)	2978 (50.1)	
Risky	374 (4.9)	342 (5.8)	
Smoking status			<0.001
Never	4122 (55.2)	2927 (50.5)	
Ex-smoker	2116 (28.3)	1660 (28.6)	
Current	1233 (16.5)	1210 (20.9)	
Menopausal status			<0.001
Surgical menopause	1554 (20.2)	1656 (27.6)	
Hormone use	1119 (15.6)	888 (14.8)	
Pre-menopausal	2842 (37.0)	1770 (29.5)	
Peri-menopausal	1769 (23.0)	1321 (22.0)	
Post-menopausal	393 (5.1)	361 (6.0)	

Data are presented as n (%) or mean ± standard deviation. Column number may not equal n as a result of missing data.

* Independent-samples *t*-test was used for continuous variable (age); chi-squared analyses were used for categorical variables.

Table S3. Percentage of women reporting multimorbidity in Surveys 2-8 by social relationship score at the previous surveys (n=7694)

Score	Survey (age range)						
	S2 (47-52)	**S3 (50-55)**	**S4 (53-58)**	**S5 (56-61)**	**S6 (59-64)**	**S7 (62-67)**	**S8 (65-70)**
≤5	33.5	47.8	59.2	67.4	71.6	79.7	84.4
6	25.8	33.7	46.7	58.9	63.6	70.9	79.4
7	24.1	33.7	40.7	50.6	68.0	69.9	75.9
8	16.1	25.4	40.4	51.2	57.3	66.7	77.7
9	12.0	21.8	34.4	48.7	54.8	62.6	71.5
10	10.2	21.1	31.7	42.3	48.5	55.7	61.5
11	11.0	17.0	27.4	40.8	49.1	57.9	63.1
12	7.1	17.6	24.4	37.4	46.4	53.9	63.1
13	8.7	14.4	25.5	34.0	47.6	53.1	63.9
14	5.8	16.8	26.7	36.6	41.9	51.0	58.7
15	4.7	19.7	25.0	33.2	46.2	54.8	57.7
Average	10.9	21.8	31.7	42.3	49.9	57.7	64.2

Table S4. Full results of associations (ORs and 95% CIs) between all variables and accumulation of multimorbidity (n=7694).

Characteristics	OR (95% CI)
Age at baseline	1.11 (1.09, 1.13)
Period (survey wave)	1.03 (1.01, 1.05)
Overall satisfaction score	
≤5	2.35 (1.94, 2.83)
6	1.79 (1.45, 2.19)
7	1.95 (1.63, 2.32)
8	1.66 (1.42, 1.94)
9	1.48 (1.28, 1.71)
10	1.28 (1.12, 1.46)
11	1.32 (1.14, 1.52)
12	1.20 (1.03, 1.38)
13	1.24 (1.07, 1.44)
14	1.10 (0.94, 1.29)
15	Ref
Marital status	
Married/de facto	Ref
Separated/divorced/widowed	1.04 (0.96, 1.13)
Never married	1.02 (0.85, 1.23)
Area of residence	
Major cities	Ref
Inner regions	1.03 (0.96, 1.10)
Outer regions	0.93 (0.86, 1.02)
Remote/very remote	0.76 (0.64, 0.89)
Education	
University/Higher degree	Ref
Trade/apprenticeship/diploma	1.10 (0.99, 1.22)
High school certificate	0.93 (0.83, 1.04)
No qualifications	1.09 (0.99, 1.20)
Country of birth	
Australia	Ref
Outside Australia	1.00 (0.93, 1.07)
Ability to manage on income	
Easy/not bad	Ref

Sometime difficult	1.21 (1.13, 1.29)
Impossible/difficult always	1.52 (1.39, 1.66)
BMI categories	
Underweight (< 18.5 kg/m^2)	1.34 (1.02, 1.77)
Normal weight (18.5-24.9 kg/m^2)	Ref
Overweight (25-29.9 kg/m^2)	1.33 (1.24, 1.43)
Obese (30-35 kg/m^2)	1.76 (1.63, 1.90)
Physical activity	
High (≥ 1200 MET min/week)	Ref
Moderate (600-1199 MET min/week)	1.04 (0.96, 1.12)
Low (40-599 MET min/week)	1.12 (1.04, 1.20)
Nil/sedentary (0-39 MET min/week)	1.20 (1.10, 1.31)
Alcohol intake	
Low risk	Ref
Non/rarely	1.06 (0.99, 1.13)
Risky	1.09 (0.97, 1.23)
Smoking status	
Never	Ref
Ex-smoker	1.10 (1.03, 1.18)
Current	1.31 (1.19, 1.44)
Menopausal status	
Surgical menopause	1.33 (1.24, 1.43)
Hormone use	1.29 (1.16, 1.44)
Oral contraceptive use	0.93 (0.74, 1.17)
Pre-menopausal	0.65 (0.57, 0.74)
Peri-menopausal	0.88 (0.79, 0.99)
Post-menopausal	Ref

Table S5. Roles of each social relationship component (column) in attenuating the associations between other social relationship component (row) and accumulation of multimorbidity (n=7694).

	Partner/ closest person	**Family members**	**Friends**	**Work/career/ study**	**Social activities**	**All**
Partner/closest person	-	39.12	20.44	16.08	38.49	64.98
Family members	23.70	-	22.76	15.63	35.34	48.54
Friends	37.36	40.34	-	20.93	79.46	122.22
Work/career/study	20.17	27.87	23.22	-	39.13	53.58
Social activities	17.89	22.72	8.18	13.41	-	27.52

Percentage of attenuation: 100 × (βModel index component − βModel index component + other component(s))/ (βModel index component). For example, 39.12% in Column 2 and Row 1 indicates that there is 39.12% attenuation when adding satisfaction with family member to the model of satisfaction with partner/closest person. 64.98% in Column 6 and Row 1 indicates that the other four social relationship components combined explained 64.98% of the association between satisfaction with partner/closest person and accumulation of multimorbidity.

Table S6. Associations (ORs and 95% CIs) of overall social relationships satisfaction score at baseline with accumulation of multimorbidity (n=7357).

Satisfaction score	Accumulation of multimorbidity
≤5	2.22 (1.79, 2.75)
6	2.10 (1.68, 2.61)
7	1.91 (1.58, 2.31)
8	1.67 (1.42, 1.97)
9	1.48 (1.27, 1.72)
10	1.36 (1.19, 1.56)
11	1.44 (1.24, 1.66)
12	1.27 (1.10, 1.46)
13	1.39 (1.20, 1.62)
14	1.09 (0.93, 1.28)
15	Ref

Table S7. Associations (ORs and 95% CIs) of overall social relationships satisfaction score with accumulation of multimorbidity in complete cases (n=4521).

Satisfaction score	Accumulation of multimorbidity
≤5	2.34 (1.86, 2.94)
6	1.80 (1.41, 2.30)
7	1.98 (1.61, 2.44)
8	1.67 (1.39, 2.01)
9	1.53 (1.29, 1.82)
10	1.29 (1.10, 1.51)
11	1.36 (1.15, 1.61)
12	1.25 (1.06, 1.48)
13	1.28 (1.08, 1.52)
14	1.14 (0.95, 1.36)
15	Ref

Table S8. Associations (ORs and 95% CIs) of overall social relationships satisfaction score with incidence of one condition and accumulation of multimorbidity (n=7357).

satisfaction score	Number of new condition(s)	
	1	**≥ 2**
≤5	1.38 (1.08, 1.77)	2.40 (1.98, 2.90)
6	1.36 (1.05, 1.76)	1.83 (1.49, 2.26)
7	1.20 (0.96, 1.50)	1.98 (1.66, 2.37)
8	1.12 (0.92, 1.35)	1.66 (1.41, 1.94)
9	1.22 (1.03, 1.45)	1.48 (1.28, 1.72)
10	1.23 (1.05, 1.44)	1.29 (1.12, 1.47)
11	1.18 (1.00, 1.40)	1.32 (1.14, 1.53)
12	1.27 (1.08, 1.50)	1.20 (1.04, 1.39)
13	1.20 (1.01, 1.43)	1.24 (1.07, 1.44)
14	1.20 (1.00, 1.43)	1.11 (0.94, 1.30)
15	Ref	Ref

The model was estimated using cumulative incidence of multimorbidity (1 or ≥2) at each survey regressed on covariate variables at the previous survey, compared with women who developed 0 new conditions. The models were all adjusted for age at baseline, marital status, area of residence, education, country of birth, ability to manage on income, physical activity, alcohol intake, smoking status, and menopausal status.