

Social relationships & partnership

Soc-B Module 1: The Biosocial Life Course 30 Sept- 4 Oct 2019



Outline

- Key dimensions social relationships
- Social relationships over the life course and in relation to ageing
- Associations between social relationships & mortality, health – biomarkers as mediators?
- Evidence of links with biomarkers
 - HPA axis response
 - Inflammation
 - Blood pressure
 - Adiposity
- Gender differences



Key dimensions of social relationships

- Structural aspects
- Functional aspects
- Social capital
- Partnership / marriage as a special case



Structural aspects of social relationships

The **quantitative** dimensions of relationships. For eg:

- Number & diversity of people in social networks
- Frequency & duration of contact with people in network.
- Structural aspects sometime applied to social participation in organisations or social activities.
- Social engagement often used to refer to participation in social activities – egs., membership of voluntary organisations / religious affiliation -- and relationships more broadly.
- Social isolation a lack of structural aspects of relationships.

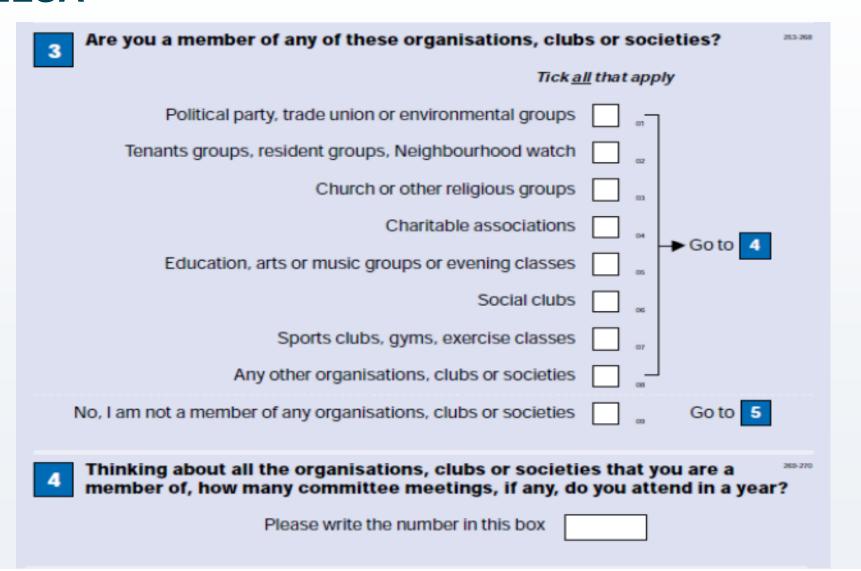


Eg. of structural social network questions in English Longitudinal Study of Ageing (ELSA)

	Three or more times a week	Once or twice a week	Once Once or twice a month	Every few months	Once or twice a year	Less than once a year or never		
Meet up (include both arranged and chance meetings)	1	2	3	4	5	6		
Speak on the phone	1	2	3	4	5	6		
Write or email	1	2	3	4	5	6		
How many of your children would you say you have a close relationship with?								



Eg. of structural social participation questions in ELSA





Functional aspects of social relationships

The **qualitative** dimensions of interactions or exchanges. For eg:

- Positive & negative emotional support
- Levels of practical or instrumental support.
- 'Closeness' how close the relationship feels.
- Loneliness a lack of functional aspects of relationships or 'perceived' social isolation.



Eg. of function social support and closeness questions in ELSA

•											
	We would now like to ask you some questions Please tick the box which best shows how you										
		Tick one box on each line									
		A Some A Not at lot little all									
	How much do they really understand the way you feel about things?	1 2 3 4 345									
	How much can you rely on them if you have a serious problem?	1 2 3 4 346									
	How much can you open up to them if you need to talk about your worries?	1 2 3 4 347									
	How much do they criticise you?	1 2 3 4 348									
	How much do they let you down when you are counting on them?	1 2 3 4 349									
	How much do they get on your nerves?	1 2 3 4 350									
11	How close is your relationship with your spous	se or partner?									
_		Tick one box									
	Ver	y close 1									
	Quite close 2										
	Not very close 3										
	Not at a	III close									



Eg. of function loneliness questions in ELSA

The next questions are about how you feel about different aspects of your life. For each one, please say how often you feel that way.	Tick <u>one</u> Hardly ever or	box on ea Some	o ch line Often	
	never	time		
How often do you feel you lack companionship?	1	2	3	89
How often do you feel left out?	1	2	3	90
How often do you feel isolated from others?	1	2	3	91
How often do you feel in tune with the people around you?	1	2	3	92



Social Capital

"Resources that are accessed by individuals as a result of their membership of a network or group."

Kawachi & Berkman 2015

- Social cohesion – area based attributes. Eg., perceptions of trust or civic participation.

- Bonding v Bridging capital
 - Bonding: Resources shared within networks/groups that are 'homophilous'. (The dark side of social capital?)
 - Bridging: Resources shared across networks.

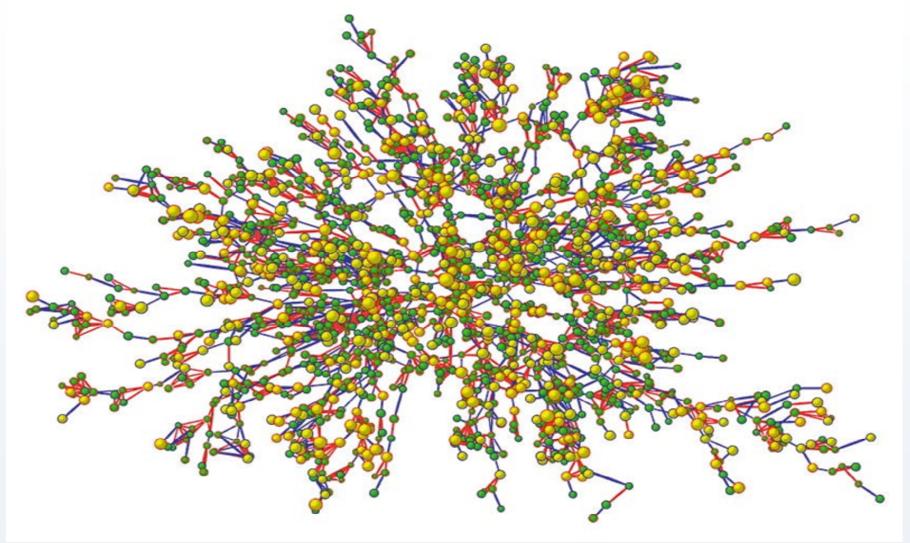


3 avenues through which social capital may influence health or behaviour

- Social contagion: Behaviours spread more quickly in cohesive networks (more frequent contact).
- Collective efficacy: Greater capacity and willingness of group to work towards common goal through collective action (eg. creating green spaces, improving environment).
- Informal social control: Ability of the group to maintain social order and intervene when deviant behaviour observed.



Obesity Network in the Framingham Heart Study in 2000 (n = 2200)





Partnership (usually marriage) as a special case

- Main focus on marriage per se, some distinguish differences between cohabiting & married couples, increasing the two are combined.
- Structural & functional dimensions also studied
 - Structural: longitudinal data allows for studies of duration of states, timing & number of transitions.
 - Functional: relationship quality & closeness.
- Strong links with socioeconomic advantage



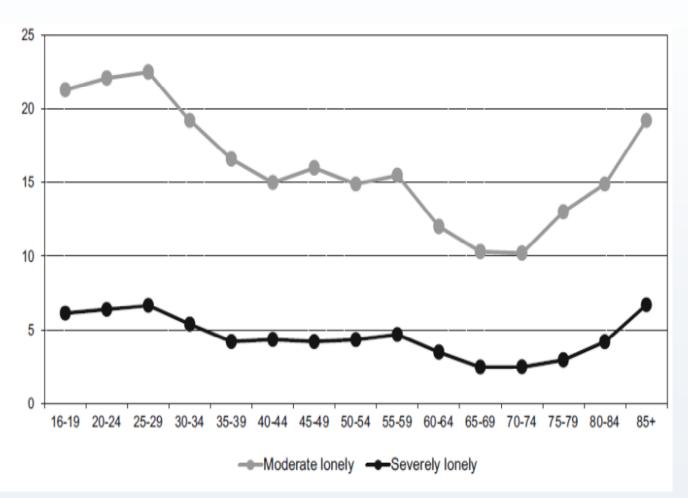
Social relationships over the life course

- Relative importance of different dimensions of social relationships may change with age.
- Life course transitions may act as pivotal moments for shifting the focus of relationships.
- The Convoy Model (Toni Antonucci) People bring their social relationships with them through life.
- Socioemotional Selectivity Theory (Laura Carstensen) Structural aspects decline with age accompanied by shift towards maintaining closest relationships.
- Older age of particular interest -- Retirement, widowhood, onset of functional limitations or health problems may increase risk of social isolation & loneliness.



Loneliness mainly an issue for older people?

Fig. 1 Prevalence (%) of moderate and severe loneliness across the life span





Social Relationships & Mortality / Health



Emile Durkheim 1858-1917 Study of suicide & social integration

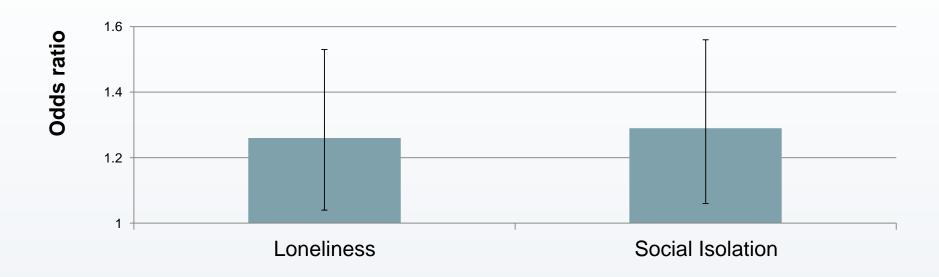
"Suicide varies inversely with degree of integration of the social groups of which the individual forms a part."

-- Suicide: a Study in Sociology

- Suicide rates higher in protestant countries than in catholic countries.
- Social integration the extent to which individuals are linked to and feel allegiance to social groups.
- Religious groups, family groups and political or nation groups possess the quality of social integration.



Meta-analysis of 70 studies of loneliness & social isolation as risk factors for mortality



"Current evidence indicates that heightened risk for mortality from a lack of social relationships is greater than that for obesity."

Holt-Lundstad et al. Perspectives Psych Sci 2015

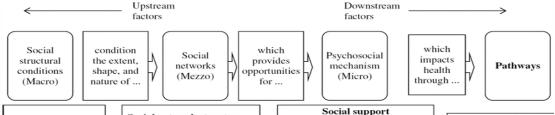


Study		Statist	ics for ea	ich study		Odds ratio and 95% CI
	Odds	Lower	Upper limit	Z/Value	p-Value	
Anstey 02	1.557	1.308	1.854	4.978	0.000	
Avlund 04	1.714	1.120	2.623	2.484	0.013	-2-
Barefoot 05	1.158	0.916	1.465	1.225	0.221	
Berlman 04	4.998	2.765	9.033	5.328	0.000	
Berleman 79	1.829	1.390	2,407	4.314	0.000	
Birket-Smith 89	1.441	0.760	2.729	1.120	0.263	
Bowling 89	1.664	1.206	2.294	3.104	0.002	[광
Bygren 96	1.505	1.310	1.730	5.761	0.000	
Case 92	1.984	1.213	3.244	2.729	0.006	_X_Y_
Cassileth 88 Ceria 01	2.735	2.183	3.426	-0.108 8.748	0.000	Y
Cohen 87	1.531	0.852	2.751	1.425	0.154	
Comman 03	1.183	1.052	1.331	2.800	0.005	
Dalgard 96	1.261	0.940	1.692	1.547	0.122	
Devins 90	0.775	0.372	1.616	-0.680	0.497	1 +
Eng 02	1.525	1.366	1.702	7.536	0.000	
Engedal 96	1.861	1.252	2.765	3.074	0.002	
Funch 83	1.186	0.718	1.960	0.668	0.504	- -
Giles 05	1.229	1.020	1.480	2.168	0.030	
Glass 99	2.462	1.961	3.091	7.767	0.000	
Goldman 95	1.349	1.206	1.508	5.246	0.000	
Goodwin 96	1.859	1.246	2.773	3.039	0.002	
Greenfield 02	1.462	1.122	1.905	2.815	0.005	
Greenwood 95	1.530	1.096	2.130	2.515	0.012	
Gustafsson 98	1.273	0.882	1.836	1.289	0.197	
Hall 93	1.260	0.933	1.700	1.510	0.131	
House 82 Hummer 99	1.571	1.433	1.832	9.617	0.110	
Iribarren 05	1.818	1.207	2.739	2.861	0.004	1 1 1 1 1 1 1 1 1 1
Inine 99	1.009	0.544	1.871	0.029	0.977	
Juon 03	1.820	0.922	3.593	1.726	0.084	
Kaplan 88	2.119	1.504	2.986	4.291	0.000	1 1 1 2 1 1
Kawachi 96	1.644	1.183	2.285	2.958	0.003	1 1 1 1 1 1 2 1 1
Keller 03	1.701	1.282	2.255	3.688	0.000	1 1 1 1
Kiely 00	1.254	0.991	1.586	1.883	0.060	
Kroenke 06	1.573	1.022	2.421	2.059	0.039	
La Cour 06	1.564	1.175	2.082	3.062	0.002	
Lennartsson 01	1.493	1.061	2.063	2.430	0.015	
Lund 00	1.346	0.895	2.023	1.428	0.153	
Lund 02	1.443	1.055	1.975	2.294	0.022	
Malmstrom 01	1.350	1.172	1.554	4.167	0.000	
Mertens 96	1.751	1.482	2.068	6.588	0.000	1 1 1 1 4 1 1
Morris 93 Nakanishi 00	1.298	1.040	1.586	2.058	0.040	
Nordentoft 93	1.525	1.063	1.918	3.607	0.000	
Oman 96	1.223	0.980	1.526	1.779	0.000	
Orth-Gomer 87	3.721	3.238	4.277	18.507	0.000	
Orth-Gomer 90	2.373	1.081	5.207	2.155	0.031	
Parlemon 00	5.207	1.661	16.324	2.830	0.005	
Rasulo 05	1.121	0.945	1.329	1.310	0.190	111611
Rodriguez-Artalejo 0	6 1.184	0.625	2.243	0.518	0.604	- 5-
Roy 96	2.145	1.605	2.866	5.155	0.000	
Rozzini 91	2.563	1.732	3.792	4.705	0.000	
Rubernan 84	1.481	1.276	1.719	5.171	0.000	
Schoenbach 86	2.217	1.530	3.211	4.212	0.000	-0-
Shmotkin 03	0.913	0.722	1.155	-0.758	0.448	1
Shye 95	2.230	1.480	3.359	3.837	0.000	L-P-
Sturdy 02	1.190	0.603	2.349	0.501	0.616	1 1 1 1 1 1 1
Sun 06	1.954	1.803	2.118	16.341	0.000	
Tucker, 96	1.305	1.031	1.651	2.217	0.027	
Vogt 92 Wader-Morrison 91	1.226	0.650	1.420	2.720 0.750	0.007	1 1 1 1 1 1
Weihs 05	1.837	0.650	4.007	1.528	0.453	
Weire US	1.572	1.455	1.700	11.391	0.000	
	1.012		1.700	11.001	0.000	0.1 0.2 0.5 1 2 5 10
						Reduced Sunfixel Increased Survival

Holt-Lunstad J, Smith TB, Layton JB (2010) Social Relationships and Mortality Risk: A Meta-analytic Review. PLOS Medicine 7(7): e1000316. https://doi.org/10.1371/journal.pmed.1000316 : PLOS | MEDICINE



Berkman & Krishna's Conceptual models of how social networks impact health.



Culture:

- · Norms and values
- Social cohesion

Socioeconomic factors:

· Relations of

production

Discrimination

· Labor market

Politics

enfranchisement

/participation

· Public policy

· Differential

political

structure

· Inequality

· Conflict

· Poverty

Laws

- Racism
- Competition/ cooperation

Social network structure:

- Size
- · Transitivity
- · Density
- · Homogeneity Centrality
- · Equivalence
- Distance

Characteristics of network ties:

- contact
- · Frequency of nonvisual contact
- · Frequency of organizational
- · Multiplexity
- · Intimacy

· Frequency of face-to-face

- participation (attendance)
- Reciprocity of ties
- Duration

Peer pressure Social comparison processes

· Instrumental & financial

Constraining/enabling

Informational

Appraisal

Emotional

adherence

Social engagement

Social influence

influences on health behaviors

Norms towards help seeking/

- Physical/cognitive exercise
- · Reinforcement of meaningful social roles
- Bonding/interpersonal attachment

Person-to-person contact:

 Close personal contact · Intimate contact sexual or romantic

Access to resources & material goods:

- Housing

· Jobs/economic opportunities · Access to health care

· Institutional contact

Negative social interactions:

- Demands
- Criticism
- · Perceived isolation
- · Direct conflict and abuse including early childhood trauma, marital conflict

Health behavioral pathways:

- Smoking
- · Alcohol/drug consumption
- Diet
- Exercise
- Adherence to treatments
- Help-seeking behavior

Psychological pathways:

- · Self-efficacy
- · Self-esteem
- Coping
- Depression/ distress
- Emotional regulation

Physiological pathways:

- · HPA axis response
- · Allostatic load
- · Immune function
- Cardiovascular reactivity
- Inflammation
- · Aging pathways
- · Transmission of infectious disease

Chapter: Social Network Epidemiology Author(s): Lisa F. Berkman and Aditi Krishna

From: Social Epidemiology

Social change:

- Urbanization
- · War/civil unrest • Economic recessions

Downloaded from Oxford Medicine Online. © Oxford University Press

Embodiment: A growing area of research



Ten years ago using objective measures of health was novel, now we're focusing in on biological measures that might help us understand <u>how the</u> **social environment** incorporated biologically.

Neuro-endocrine, immune & metabolic systems:

- > interrelated,
- influenced by stress
- > linked with chronic illness.

Biological stress responses to loneliness or lack of social contact (or lack of control or stress related to social position, economic deprivation, work stress, etc)

Neuro-endocrine -- cortisol Metabolic risk

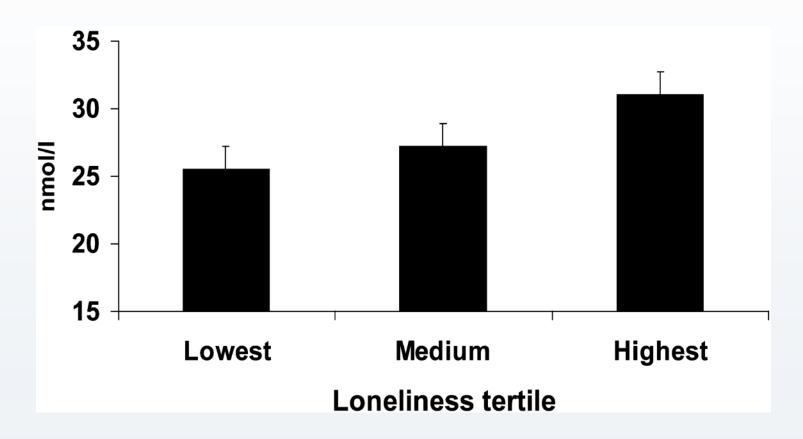
- Waist circumference
- Systolic & diastolic blood pressure
- HDL cholesterol
- Triglycerides
- Glycated haemoglobin

Inflammation

- -- C-Reactive Protein
- -- Fibrinogen



Mean increase in <u>cortisol</u> between waking and 30 min later in relation to loneliness tertile.



Values are adjusted for waking cortisol value, sex, grade of employment, smoking, and <u>body mass index</u>.



Association between loneliness and inflammatory markers.

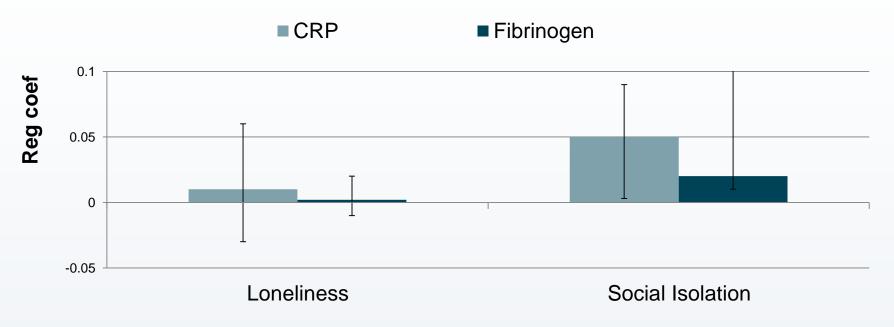
	Ln(CRP)	Ln(Fibrinogen)
	β (SE), p-value	β (SE), p-value
Loneliness	-0.03 (0.03),0.269	-0.01 (0.01), 0.043
Age	0.01 (0.01),0.109	0.01 (0.01), <0.001
Female	-0.14 (0.09),0.122	-0.08 (0.02), <0.001
Racial/ethnic minority	0.11 (0.11),0.305	0.03 (0.02), 0.120
Married/partnered	0.11 (0.10),0.265	-0.02 (0.02), 0.327
More than high school education	0.09 (0.10),0.379	0.01 (0.02), 0.776
Current smoker	0.42 (0.14),0.004	0.05 (0.03), 0.097
Current drinker	-0.06 (0.10),0.552	-0.03 (0.02), 0.090
BMI	0.09 (0.01),<0.001	0.01 (0.01), <0.001
Prevalent hypertension or diabetes	-0.16 (0.09),0.094	-0.01 (0.02), 0.717
N	441	441
Adjusted R ²	0.24	0.21

Estimates are adjusted for study site, current use of anti-inflammatory medications, and recent infection. Racial/ethnic minority includes African American, Hispanic, and Chinese.

doi:10.1371/journal.pone.0158056.t002



Association between loneliness & social isolation & inflammation in ELSA (cross-sectional at wave 2). (N = 5,899)



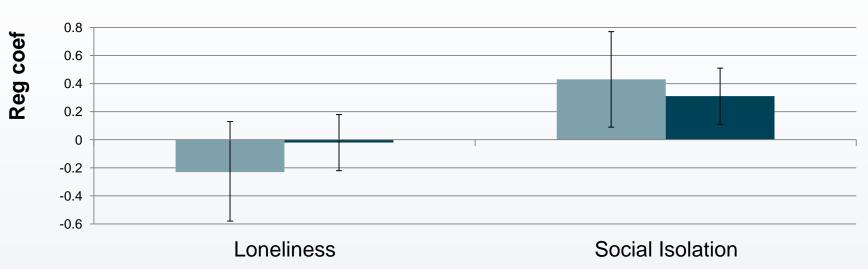
Loneliness & social isolation mutually adjusted + adjusted for age, gender, limiting long-standing illness, depressive symptoms, marital status & wealth.

Source: Shankar et al. Health Psych 2011



Association between loneliness & social isolation & blood pressure in ELSA (cross-sectional at wave 2). (N = 8,688)



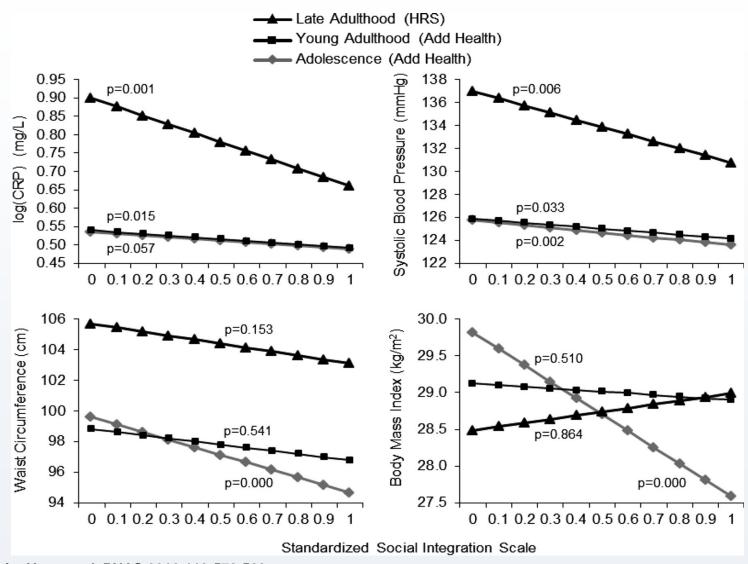


Loneliness & social isolation mutually adjusted + adjusted for age, gender, limiting long-standing illness, depressive symptoms, marital status & wealth.

Source: Shankar et al. Health Psych 2011



Prospective associations of social integration with biomarkers of physiological functioning over the life course.





Work by last year SocB student rotation – Emma Walker, *Brain, Behaviour & Immunity*

	CRP	Fibrinogen	WBC	IGF-1
Fuly-adjusted*	Coef (95% CI)	Coef (95% CI)	Coef (95% CI)	Coef (95% CI)
Social engagement	-0.01	-0.01	-0.04	-0.03
	(-0.02 to 0.001)	(-0.02 to -0.003)	(-0.08 to -0.002)	(-0.12 to 0.07)
Living with somebody	-0.06	-0.10	-0.24	0.32
	(-0.10 to -0.02)	(-0.15 to -0.05)	(-0.42 to -0.06)	(-0.2 to 0.8)
Low	-0.004	-0.001	-0.01	0.13
loneliness	(-0.02 to 0.01)	(-0.01 to 0.01)	(-0.06 to 0.01)	(0.03 to 0.24)

^{*}time invariant factors, marital status, employment status, wealth, chronic illness, chronic pain, alcohol consumption, smoking and sedentary behaviours, depression



Mediation in social isolation → mortality

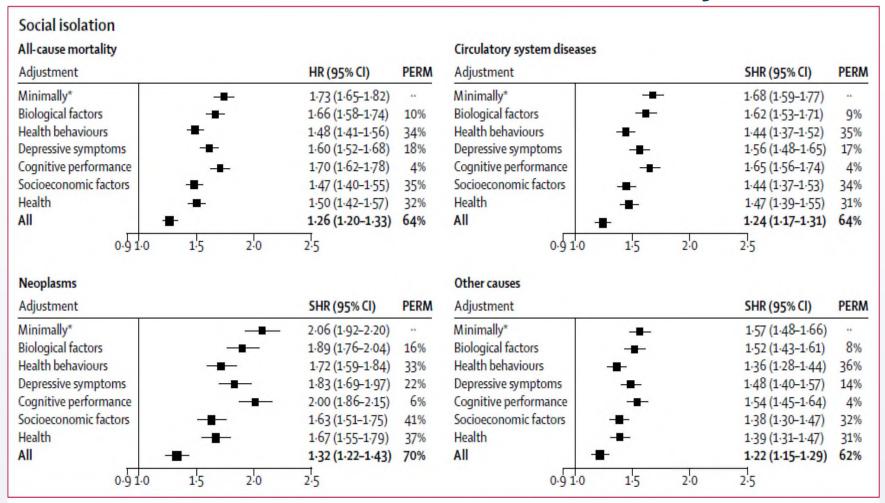


Figure 1: Proportions of the social isolation–mortality association attributable to biological, behavioural, and psychological factors HR=hazard ratio. PERM=percentage of excess risk mediated. SHR=sub-hazard ratio. *Adjusted for age, sex, ethnic origin, and chronic disease.



Mediation in loneliness → mortality

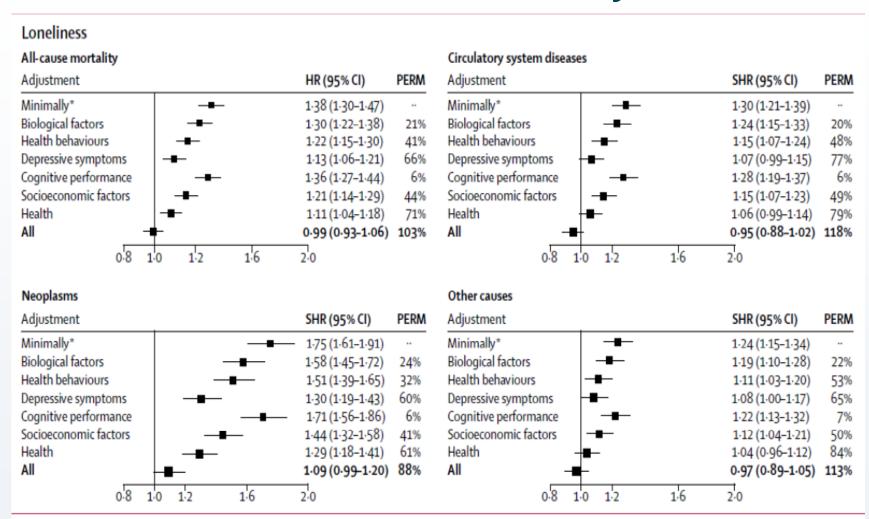
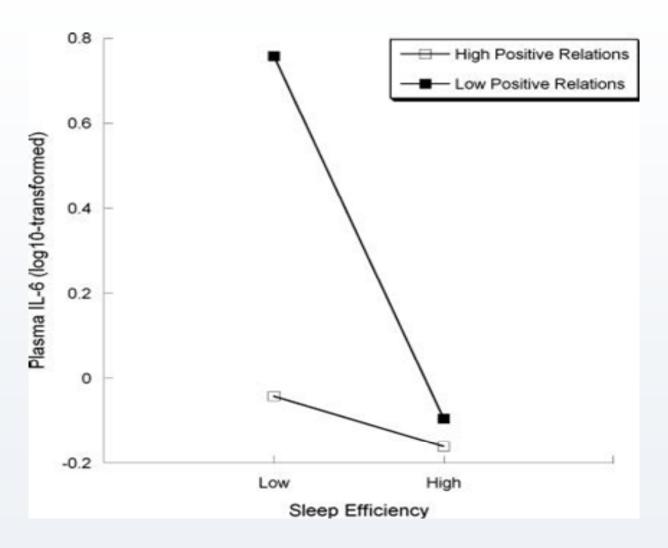


Figure 2: Proportions of the Ioneliness–mortality association attributable to biological, behavioural, and psychological factors HR=hazard ratio. PERM=percentage of excess risk mediated. SHR=sub-hazard ratio. *Adjusted for age, sex, ethnic origin, and chronic disease.



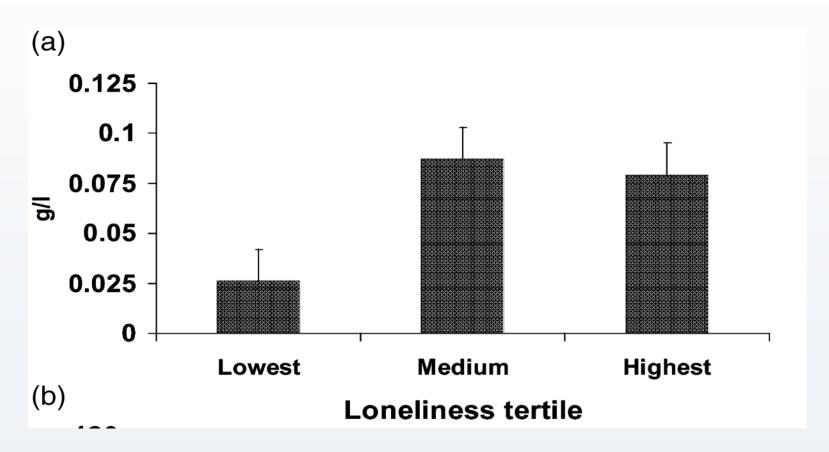
Positive relations as buffer against stress.



Source: Friedman et al. PNAS 2005



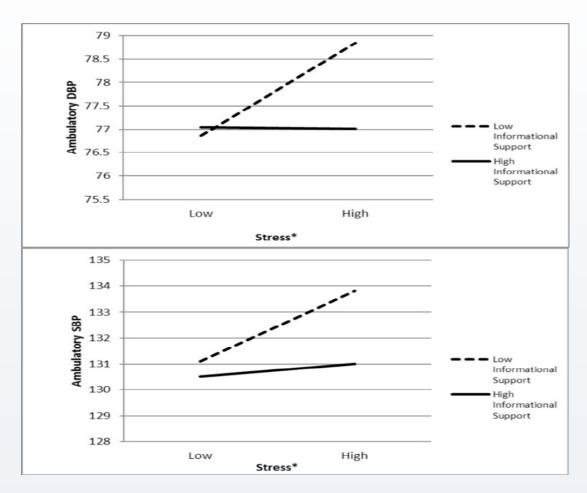
Mean changes in plasma <u>fibrinogen</u> between baseline and stress blood samples by tertiles of loneliness.



Adjusted for sex, grade of employment, smoking, control at work.



Does social support moderate associations between stress and BP?



Age, gender, household income, body mass, posture, activity level, a prior meal and time (e.g., first, second reading) Source: Bowen et al. Health Psychol 2014



Gender & Social Relationships

- Women have larger social networks, more social support.
- Women's greater social integration may contribute to their greater longevity.
- Marriage is more important as a source of support for men.
 - Men gain the benefits of marriage without the cost of domestic & caregiving responsibilities.
- Will weakening gender norms and changing nature of partnerships – women no longer economically dependent on marriage -- reverse findings above?
 - Some evidence for 'yes' (Rogers et al. 2010; Stohschein et al. 2005; Uecker 2013; Umberson & Williams 2005; Williams 2003)

Gender & Social Relationships

- Why are social relationships more important for women than men?
 - Evolutionary perspective: Women had responsibility for care of immature offspring – greater need than men to be able to turn to social group for protection in times of threat.
 - Sociological perspective: Gender norms & social institutions structure and legitimate competitiveness amongst boys and intimacy & nurturing amongst girls.
- Are women more 'reactive' to their relationships? Perhaps psychologically, but not physically.
 - Associations stronger for mental health
 - But not CVD, mortality or cognitive outcomes.
 - For inflammation may be stronger for men



Social networks are associated with fibrinogen concentration in elderly men.

TABLE 3. Odds Ratios (OR) and R² Values for Elevated Fibrinogen Concentrations (in the Highest Concentration Quartile >336 mg/dl)

According to Social Network (SN) Quartile

	Model 1				Model 2				Model 3			
	OR	95% CI	p	R ²	OR	95% CI	р	R ²	OR	95% CI	р	R ²
SN Quartile, Men												
4 (high; n = 122)	1.0			0.03	1.0			0.06	1.0			0.12
3(n = 87)	1.70	0.86-3.36	.12		1.73	0.86-3.47	.12		1.68	0.81-3.46	.16	
2(n = 92)	2.09	1.08-4.02	.03		2.31	1.16-4.63	.02		2.25	1.09-4.69	.03	
1 (low; n = 74)	2.40	1.21-4.75	.01		2.61	1.26-5.42	.01		2.29	1.07-4.89	.03	
SN Quartile, Women												
4 (high; n = 121)	1.0			0.01	1.0			0.05	1.0			0.10
3 (n = 104)	1.07	0.59-1.93	.83		1.10	0.60-2.07	.72		0.97	0.51-1.83	.92	
2 (n = 118)	1.11	0.63-1.97	.79		1.14	0.63-2.07	.67		1.10	0.59-2.06	.76	
1 (low; n = 82)	0.78	0.40-1.50	.31		0.67	0.33-1.36	.26		0.57	0.27-1.21	.15	

CI = confidence interval; SN = social networks.

Model 1, no adjustment; Model 2, adjusted for age, race, education, co-morbidity, and physical functioning; Model 3, adjusted for age, race, education, co-morbidity, physical functioning, depression, smoking, alcohol consumption, physical activity, body mass index and depression.



Loucks, Eric; Berkman, Lisa; Gruenewald, Tara; Seeman, Teresa Psychosomatic Medicine. 67(3):353-358,
May/June 2005.



Social networks are associated with C-Reactive Protein concentration in elderly men.

Odds ratios for elevated C-reactive protein (CRP) concentrations (in highest concentration quartile >3.19 mg/L) according to social network quartile in MacArthur Successful Aging Study, 1988–1989

		Model Adjustment						
	Unadjusted		Age and	Race/Ethnicity	Clinical Risk Factors			
	OR	95% CI	OR	95% CI	OR	95% CI		
Social network level, men								
4 (high, n = 124)	1.00		1.00		1.00			
3 (n = 88)	1.74	0.90 - 3.36	1.91	0.97-3.76	1.46	0.71 - 2.99		
2 (n = 93)	1.70	0.89-3.27	2.18*	1.09-4.34	1.57	0.75-3.29		
1 (low, n = 75)	2.18*	1.17-4.42	2.90*	1.41-5.96	2.23*	1.05-4.76		
Social network level, women								
4 (high, n = 121)	1.00		1.00		1.00			
3 (n = 104)	1.17	0.63 - 2.14	1.28	0.69 - 2.38	1.21	0.62 - 2.37		
2 (n = 118)	0.99	0.54-1.80	1.06	0.58-1.96	1.22	0.62 - 2.38		
1 (low, n = 82)	1.00	0.52-1.95	1.13	0.56-2.20	0.93	0.43-1.99		

Clinical risk factors included age, race/ethnicity, socioeconomic status, cardiovascular disease, other major/chronic conditions (diabetes, high blood pressure, cancer, and broken bones), physical functioning, smoking, alcohol consumption, physical activity, body mass index, and depression.

Source: Loucks et al. Am J Cardiol 2006

^{*} Statistically significant (p < 0.05).



Social networks and C-Reactive Protein in the NHANES.

	Social network index						Social n	etwork index	
	4: most ties	3	2	0, 1: fewest ties		4: most ties	3	2	0, 1: fewest ties
	OR	OR (95% CI)	OR (95% CI)	OR (95% CI)		OR	OR (95 % CI)	OR (95% CI)	OR (95% CI)
Age 20-59 ye	ears (N = 464	19)			Age 20-59 v	ears (N = 542	(3)		
Model 1 ⁿ	1.00	0.93	1.18	1.20	Model 1 ⁿ	1.00	1.06	1.03	1.38
		(0.57-1.52)	(0.84-1.66)	(0.79-1.81)			(0.80-1.39)	(0.80-1.34)	(1.04-1.85)
Model 2 ^h	1.00	0.86 (0.53–1.40)	0.96 (0.67-1.38)	0.93 (0.62-1.39)	Model 2 ^b	1.00	1.05 (0.75–1.47)	0.88 (0.65–1.21)	1.22 (0.85–1.76)
Age ≥ 60 yea	rs(N = 2323))			Age ≥60 vea	rs (N=2423)			
Model 1 ⁿ	1.00	1.37 (0.88-2.13)	1.74 (1.19-2.55)	2.09 (1.37–3.21)	Model 1*	1.00	1.12 (0.81-1.56)	1.17 (0.78–1.77)	1.15 (0.74–1.79)
Model 2 ^h	1.00	1.29 (0.83-2.03)	1.54 (1.04-2.28)	1.80 (1.11–2.92)	Model 2 ^b	1.00	1.06 (0.75–1. 4 9)	1.00 (0.66–1.50)	0.91 (0.57–1.46)

OR = odds ratio; CI = confidence interval.

Men Women

Source: Ford et al. Ann Epidemiol 2006

[&]quot;Model 1 adjusted for age and race or ethnicity.

Model 2 adjusted for age, race or ethnicity, education, smoking status, alcohol use, physical activity, body mass index, hypertension, total cholesterol concentration, and self-reported diabetes mellitus.

OR = odds ratio; CI = confidence interval.

[&]quot;Model 1 adjusted for age and race or ethnicity.

Model 2 adjusted for age, race or ethnicity, education, smoking status, alcohol use, physical activity, body mass index, hypertension, total cholesterol concentration, and self-reported diabetes mellitus.



SUMMARY: Social relationships & biology

MAIN EFFECTS:

- Structural aspects association with inflammation and blood pressure, adiposity for younger people?
- Loneliness effects attenuated by depressive symptoms (physical health).

BUFFER EFFECTS: Some evidence that inflammatory and blood pressure responses to stress greater for those with fewer social ties, less support or greater loneliness.

GENDER DIFFERENCES: Some evidence of higher inflammation for those with fewer social ties for men but not women.