

# **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)

**14**

**On average, how often do you do each of the following with any of your children, not counting any who live with you?**

*Tick one box on each line*

	Three or more times a week	Once or twice a week	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)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	359
Speak on the phone	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	360
Write or email	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	361

**15**

**How many of your children would you say you have a close relationship with?**

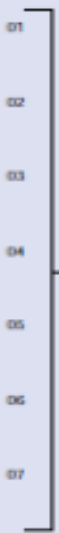
362-363

Please write the number in this box

# Eg. of structural social participation questions in ELSA

**3** Are you a member of any of these organisations, clubs or societies? 253-268

*Tick all that apply*

Political party, trade union or environmental groups	<input type="checkbox"/>	01			
Tenants groups, resident groups, Neighbourhood watch	<input type="checkbox"/>	02			
Church or other religious groups	<input type="checkbox"/>	03			
Charitable associations	<input type="checkbox"/>	04			
Education, arts or music groups or evening classes	<input type="checkbox"/>	05			
Social clubs	<input type="checkbox"/>	06			
Sports clubs, gyms, exercise classes	<input type="checkbox"/>	07			
Any other organisations, clubs or societies	<input type="checkbox"/>	08			
No, I am not a member of any organisations, clubs or societies			<input type="checkbox"/>	09	Go to <b>5</b>

**4** Thinking about all the organisations, clubs or societies that you are a member of, how many committee meetings, if any, do you attend in a year? 269-270

Please write the number in this box

# 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

**10** We would now like to ask you some questions about your spouse or partner. Please tick the box which best shows how you feel about each statement.

*Tick one box on each line*

	A lot	Some	A little	Not at all	
How much do they really understand the way you feel about things?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	345
How much can you rely on them if you have a serious problem?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	346
How much can you open up to them if you need to talk about your worries?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	347
How much do they criticise you?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	348
How much do they let you down when you are counting on them?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	349
How much do they get on your nerves?	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	350

**11** How close is your relationship with your spouse or partner?

351

*Tick one box*

Very close  1

Quite close  2

Not very close  3

Not at all close  4



# Eg. of function loneliness questions in ELSA

8

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 one box on each line

Hardly ever or never      Some of the time      Often

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.”

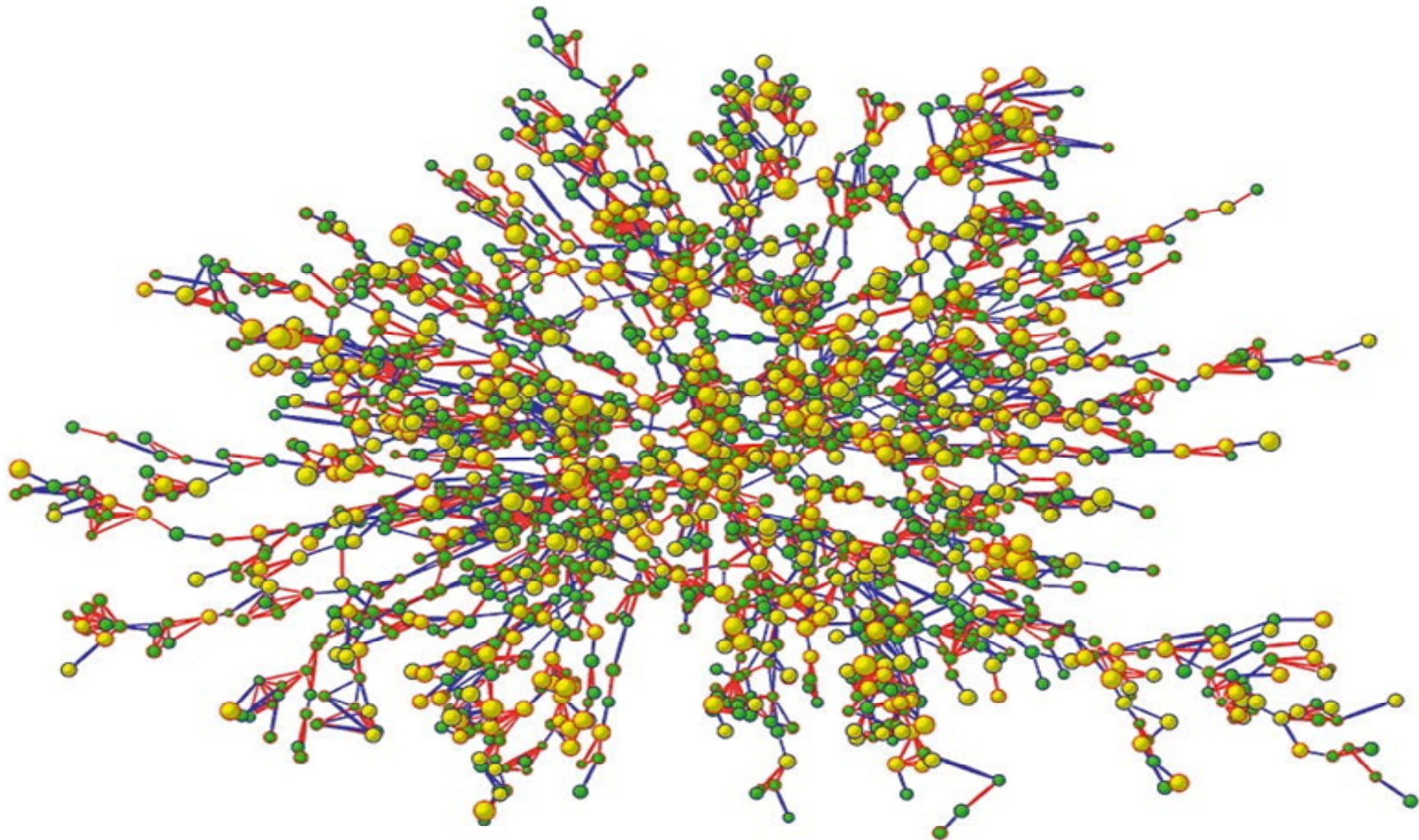
- Kawachi & Berkman 2015

- 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

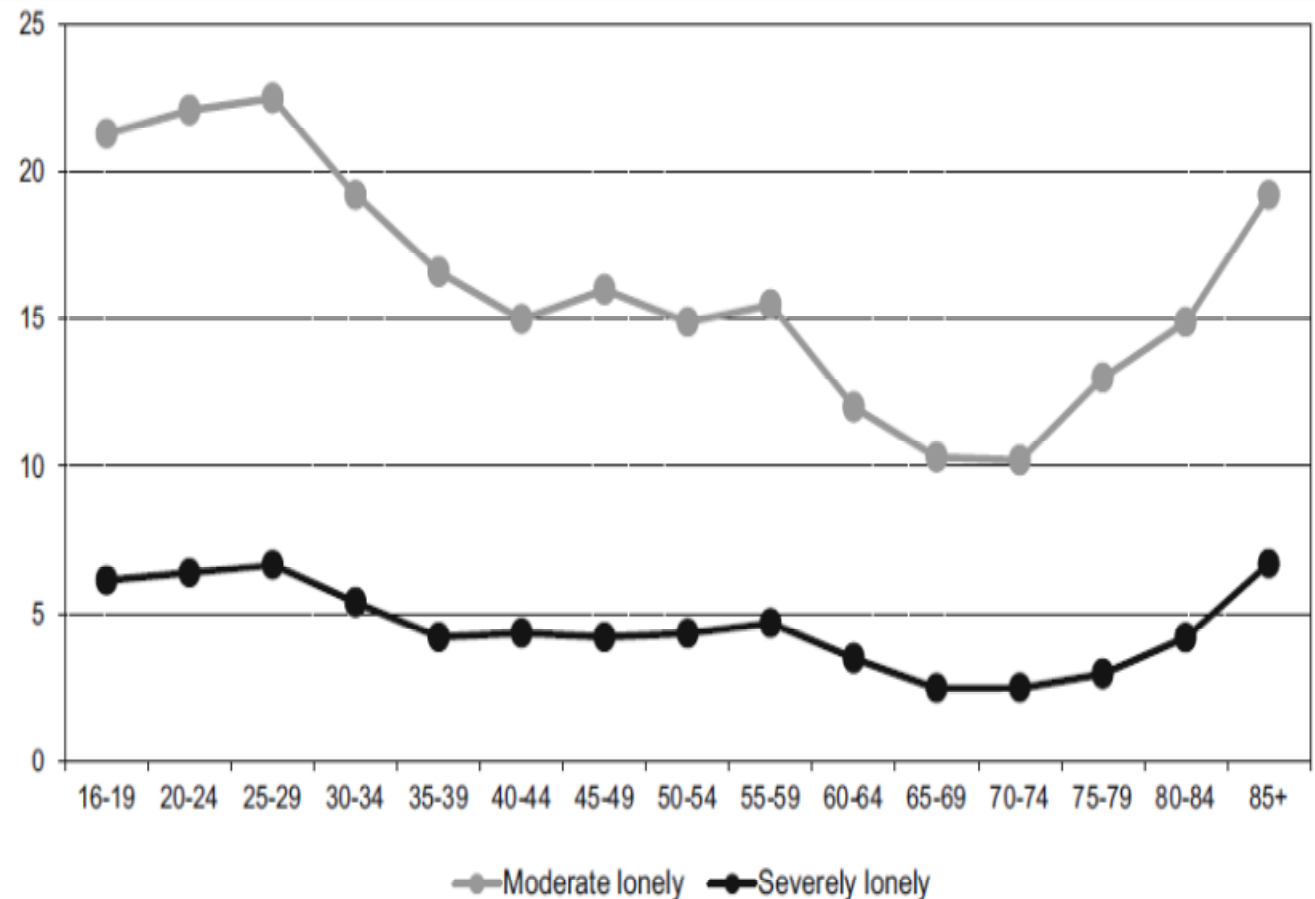
- Main focus on marriage per se, some distinguish differences between cohabiting & married couples, increasing the two are combined.
- Structural & functional dimensions also studied
  - Structural: longitudinal data allows for studies of duration of states, timing & number of transitions.
  - Functional: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

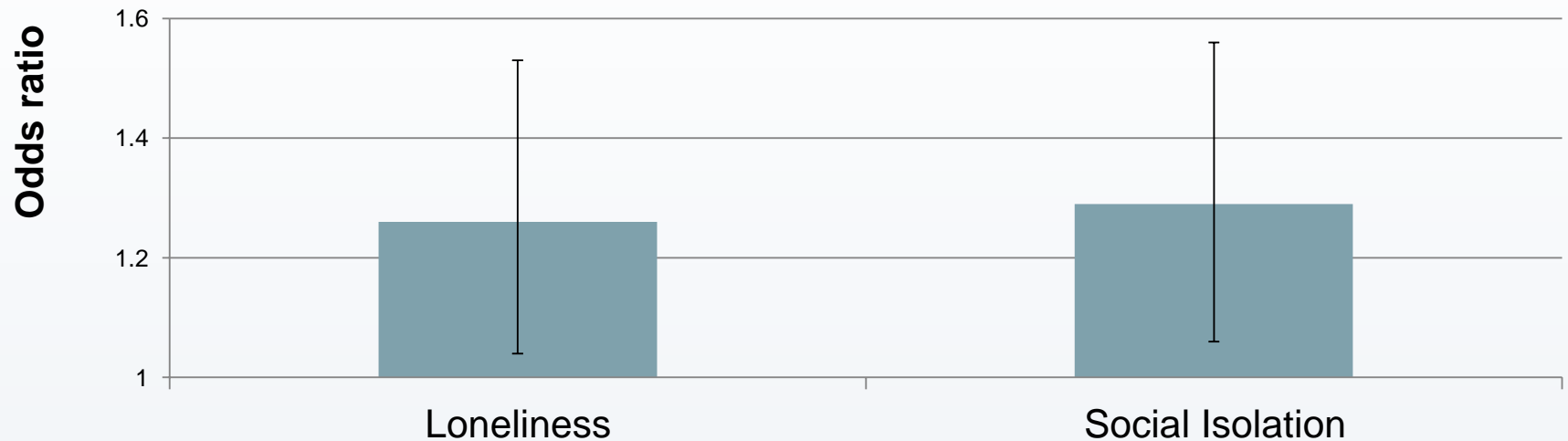
“Suicide varies inversely with degree of integration of the social groups of which the individual forms a part.”

-- *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.

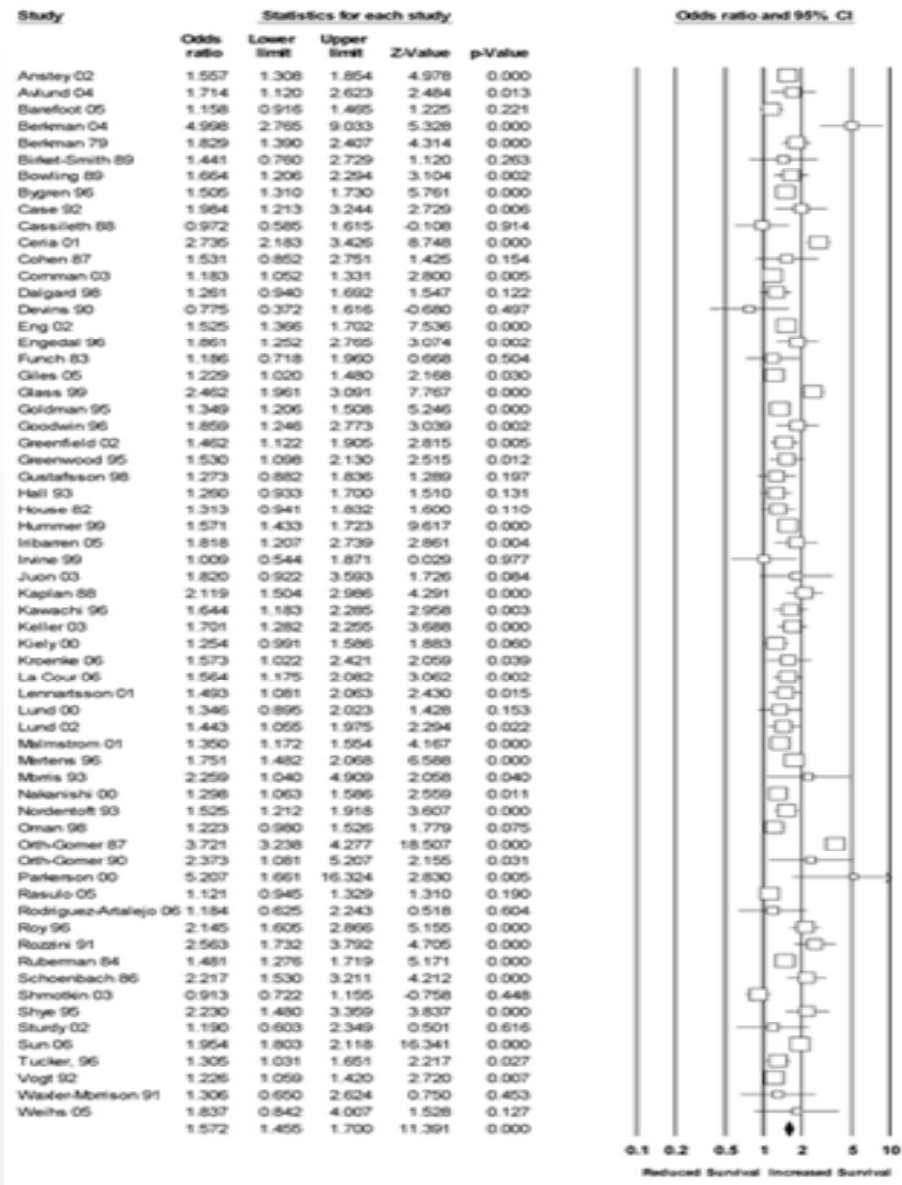


## Meta-analysis of 70 studies of loneliness & social isolation as risk factors for mortality



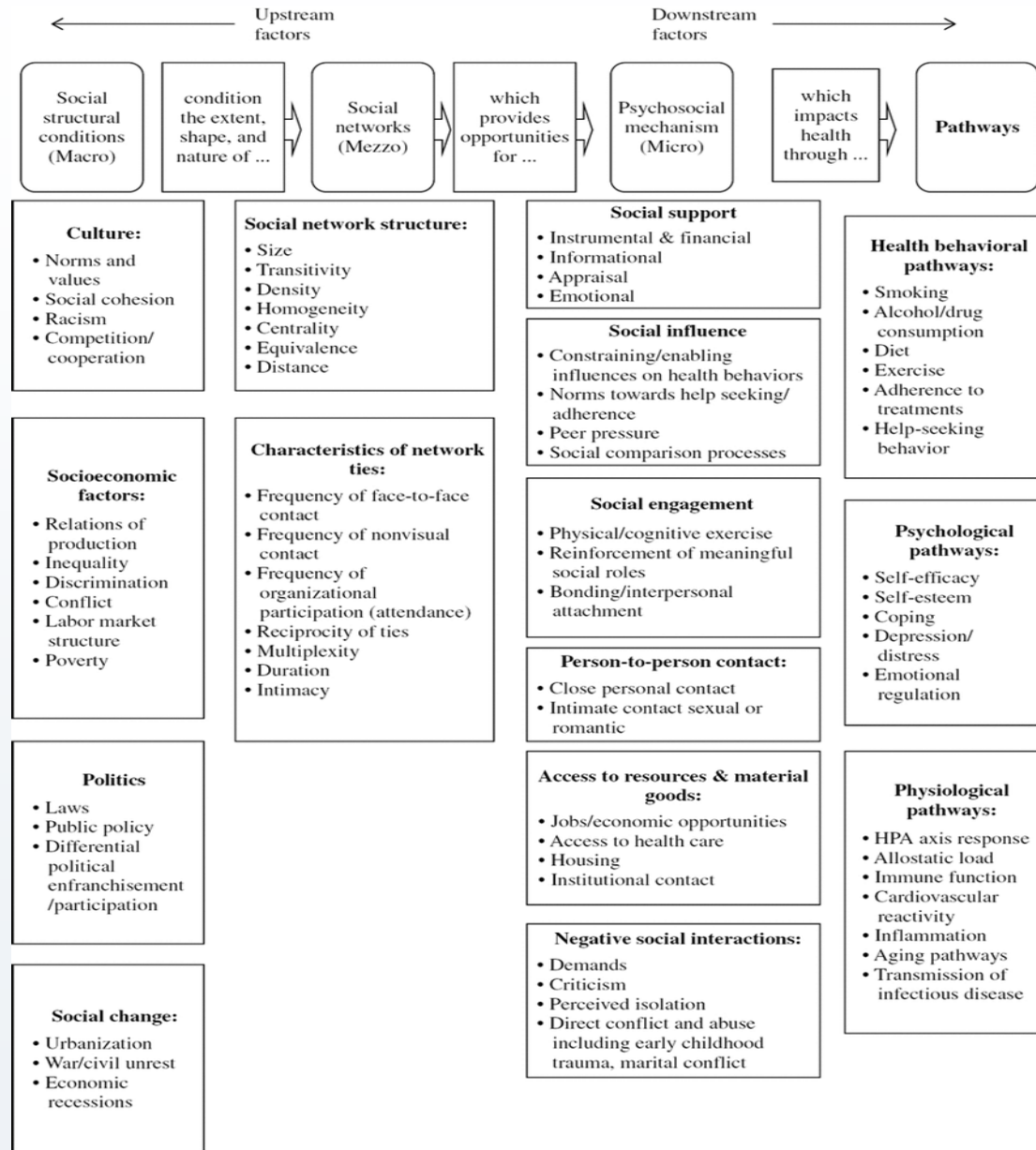
“Current evidence indicates that heightened risk for mortality from a lack of social relationships is greater than that for obesity.”

*Holt-Lundstad et al. Perspectives Psych Sci 2015*



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>  
<http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1000316>

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



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

Ten years ago using objective measures of health was novel, now we're focusing in on biological measures that might help us understand how the **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**

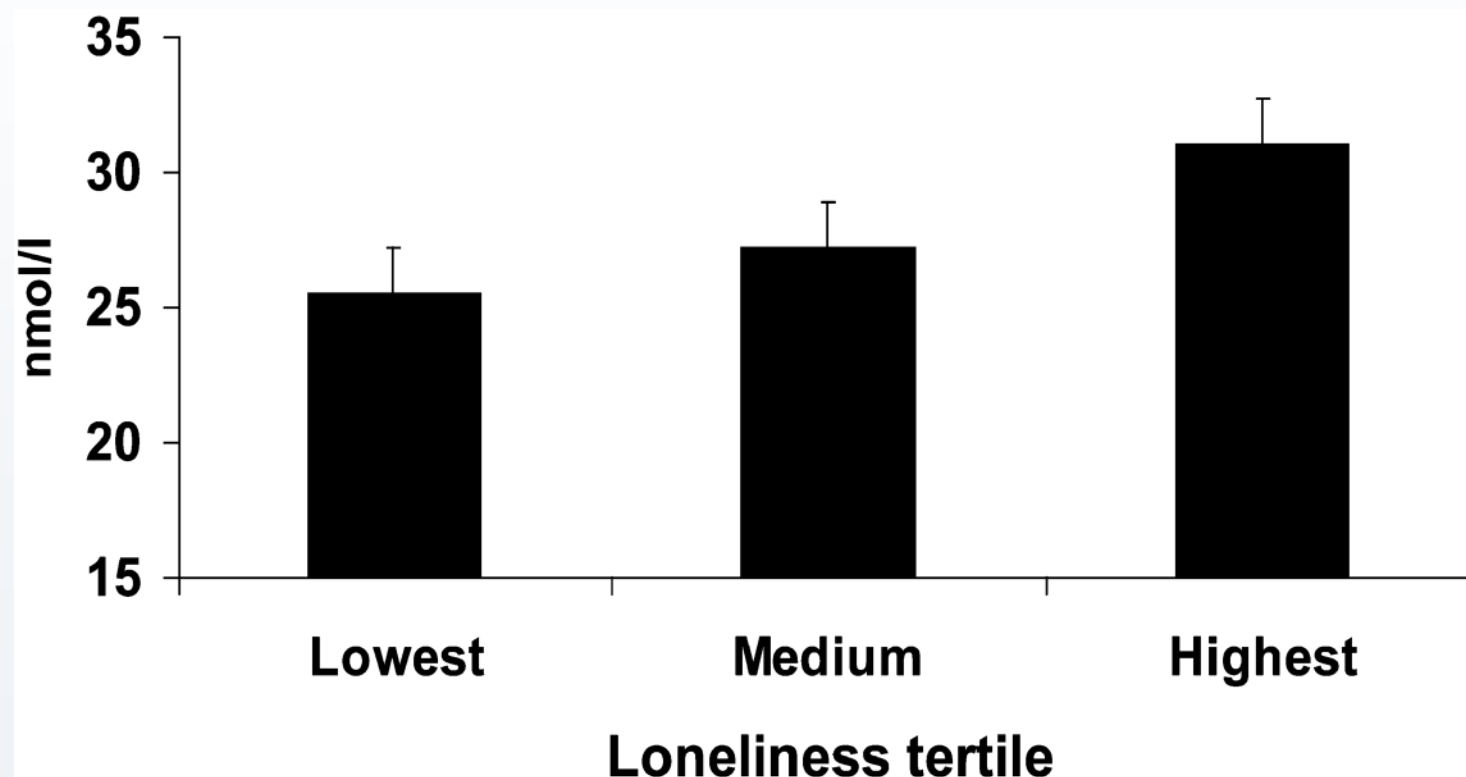
**Metabolic risk**

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

**Inflammation**

- C-Reactive Protein
- Fibrinogen

Mean increase in cortisol between waking and 30 min later in relation to loneliness tertile.



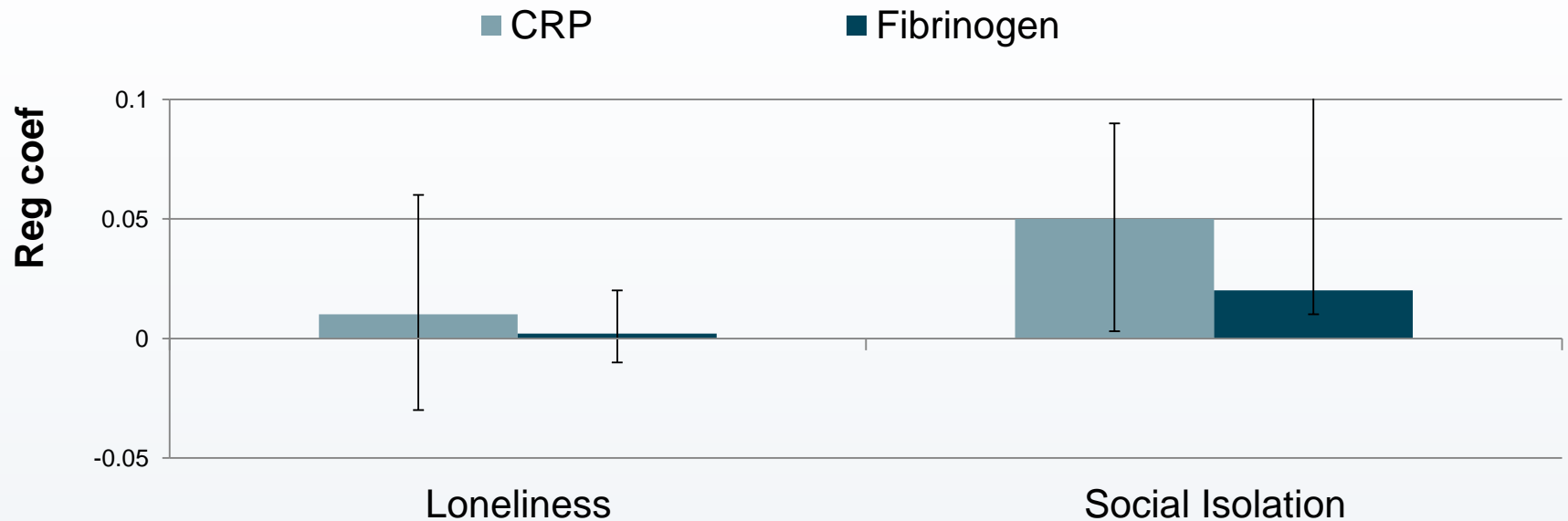
## Association between loneliness and inflammatory markers.

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

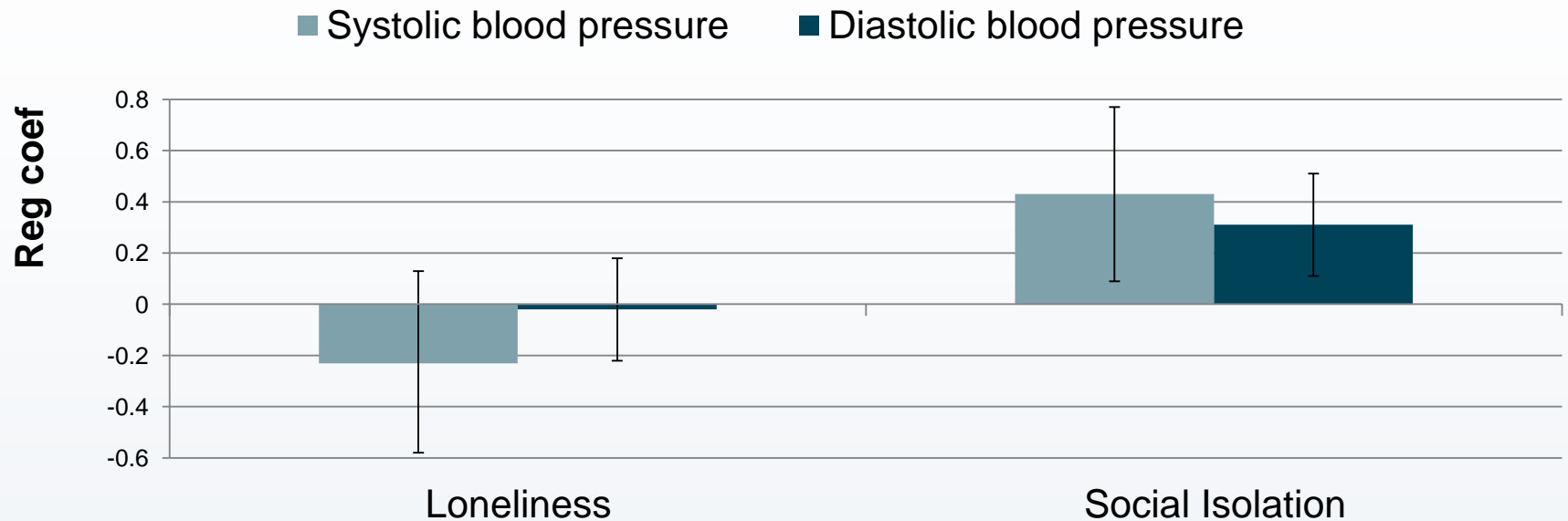
doi:10.1371/journal.pone.0158056.t002

## 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.

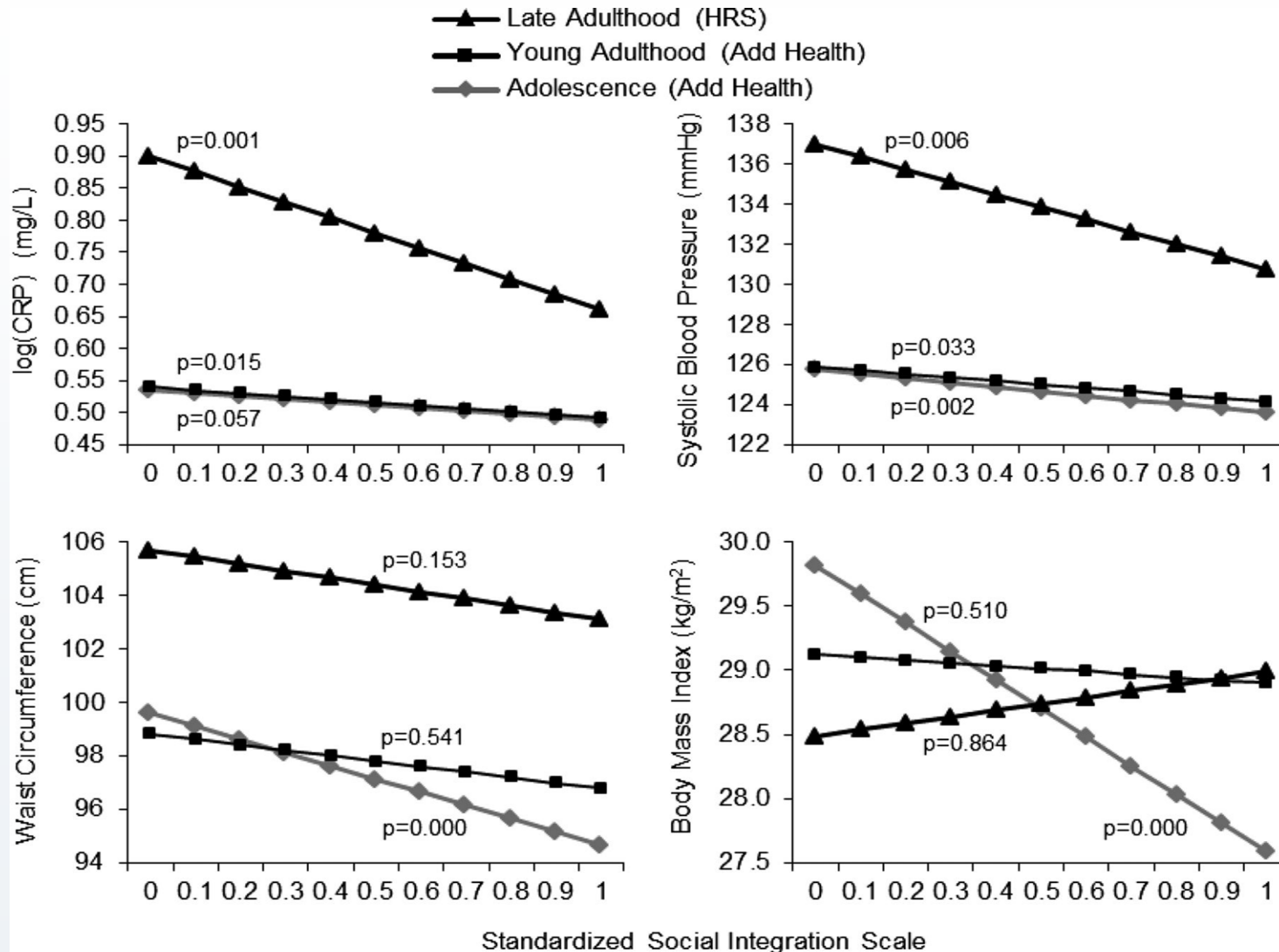
## Association between loneliness & social isolation & blood pressure in ELSA (cross-sectional at wave 2). (N = 8,688)



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



# 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
Fully-adjusted*	Coef (95% CI)	Coef (95% CI)	Coef (95% CI)	Coef (95% CI)
Social engagement	-0.01 (-0.02 to 0.001)	<b>-0.01</b> <b>(-0.02 to -0.003)</b>	<b>-0.04</b> <b>(-0.08 to -0.002)</b>	-0.03 (-0.12 to 0.07)
Living with somebody	<b>-0.06</b> <b>(-0.10 to -0.02)</b>	<b>-0.10</b> <b>(-0.15 to -0.05)</b>	<b>-0.24</b> <b>(-0.42 to -0.06)</b>	0.32 (-0.2 to 0.8)
Low loneliness	-0.004 (-0.02 to 0.01)	-0.001 (-0.01 to 0.01)	-0.01 (-0.06 to 0.01)	<b>0.13</b> <b>(0.03 to 0.24)</b>

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

Walker et al. BBI, 2019

<https://doi.org/10.1016/j.bbi.2019.08.189>

# Mediation in social isolation → mortality

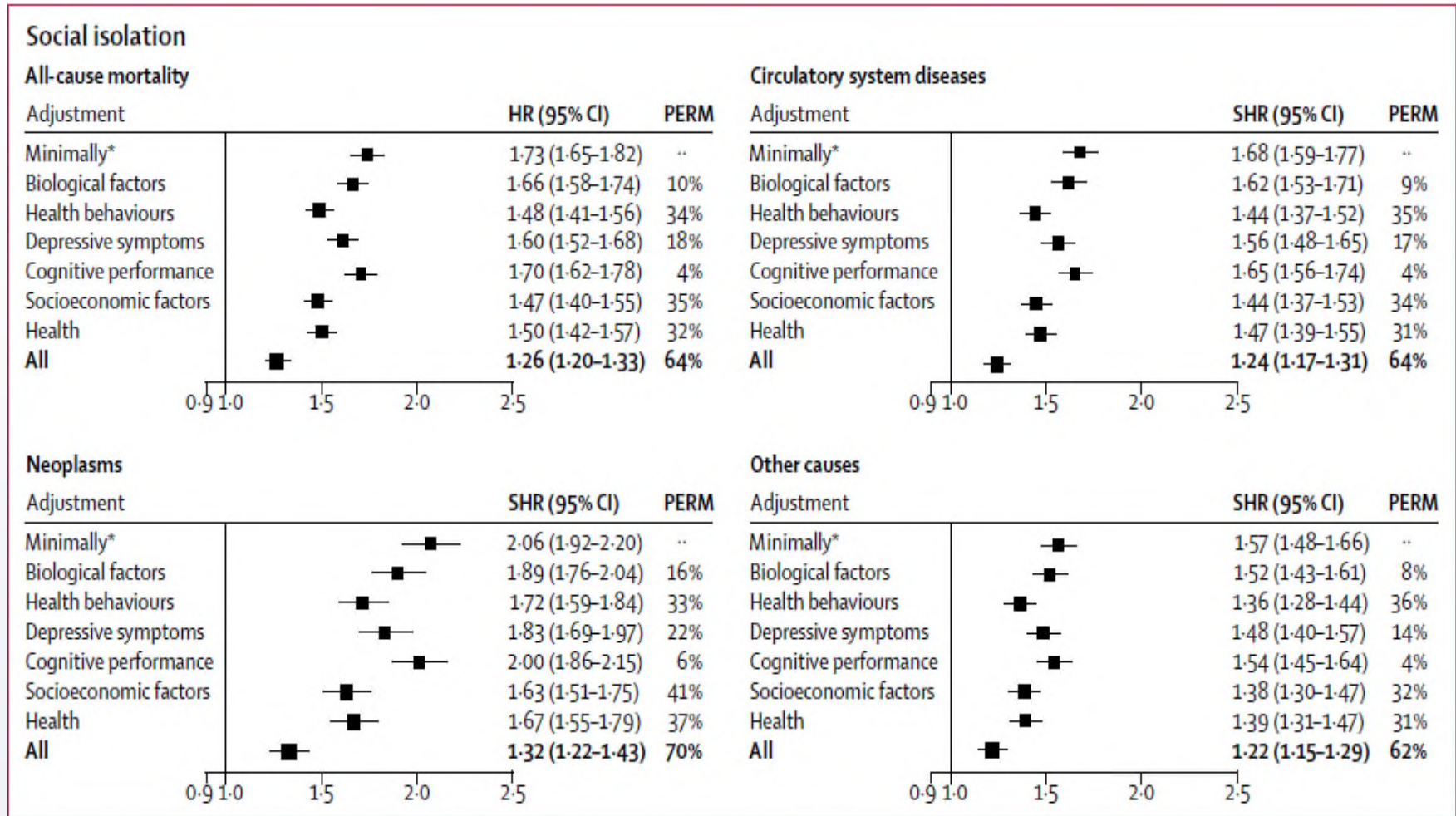
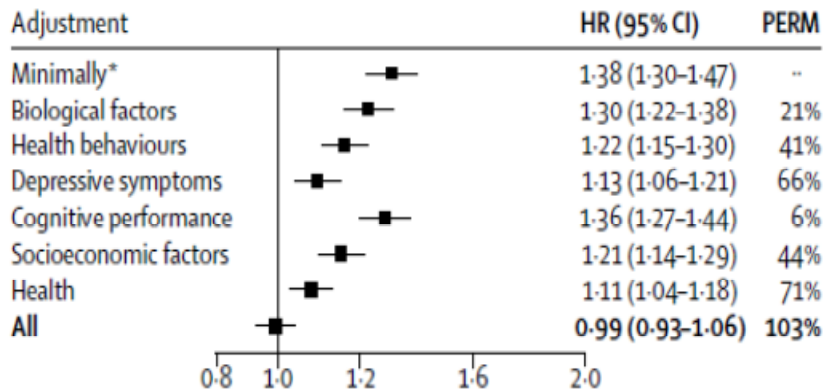


Figure 1: Proportions of the social isolation–mortality association attributable to biological, behavioural, and psychological factors  
 HR=hazard ratio. PERM=percentage of excess risk mediated. SHR=sub-hazard ratio. \* Adjusted for age, sex, ethnic origin, and chronic disease.

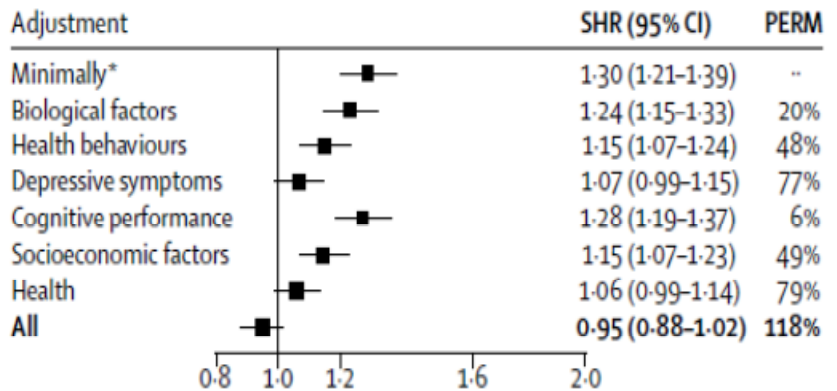
# Mediation in Loneliness → mortality

## Loneliness

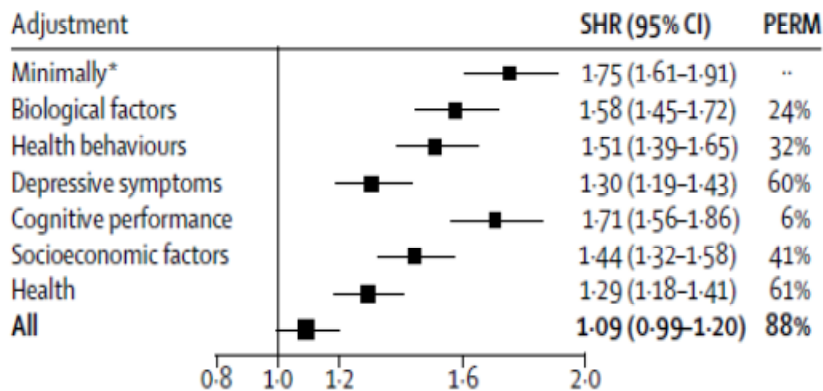
### All-cause mortality



### Circulatory system diseases



## Neoplasms



## Other causes

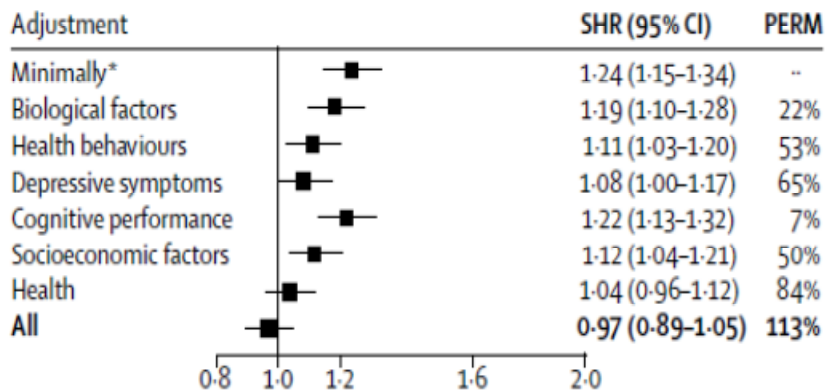
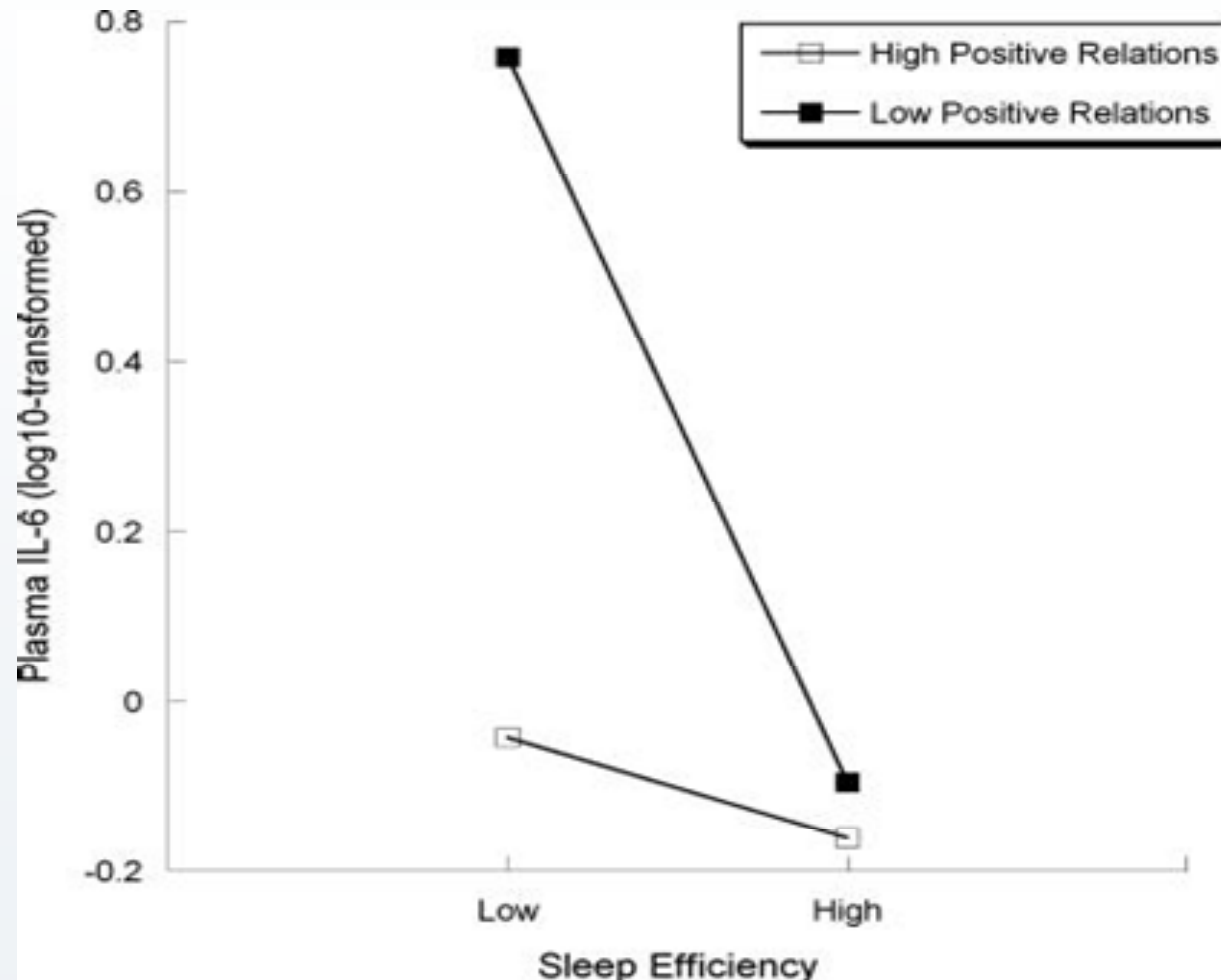
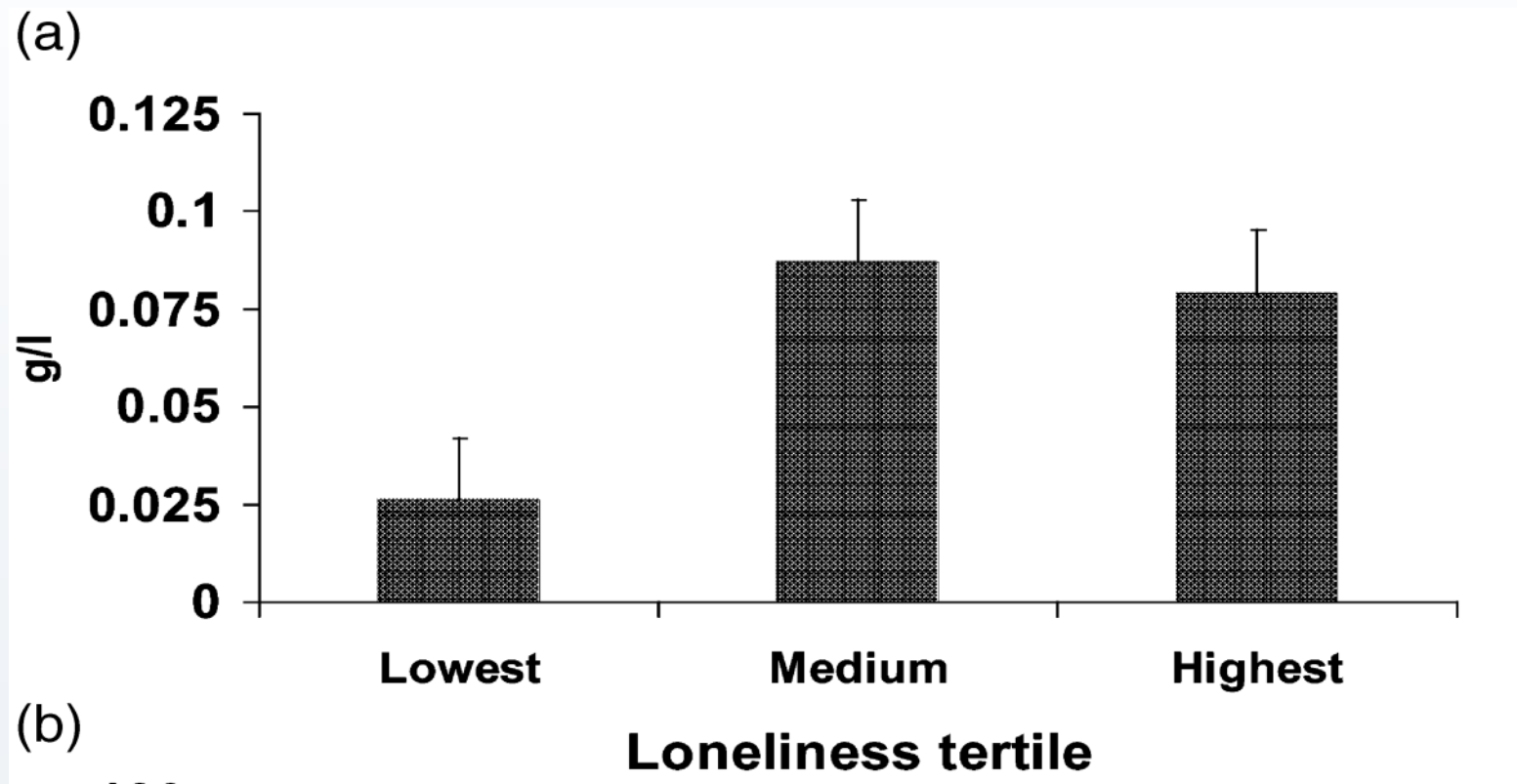


Figure 2: Proportions of the loneliness–mortality association attributable to biological, behavioural, and psychological factors  
 HR=hazard ratio. PERM=percentage of excess risk mediated. SHR=sub-hazard ratio. \*Adjusted for age, sex, ethnic origin, and chronic disease.

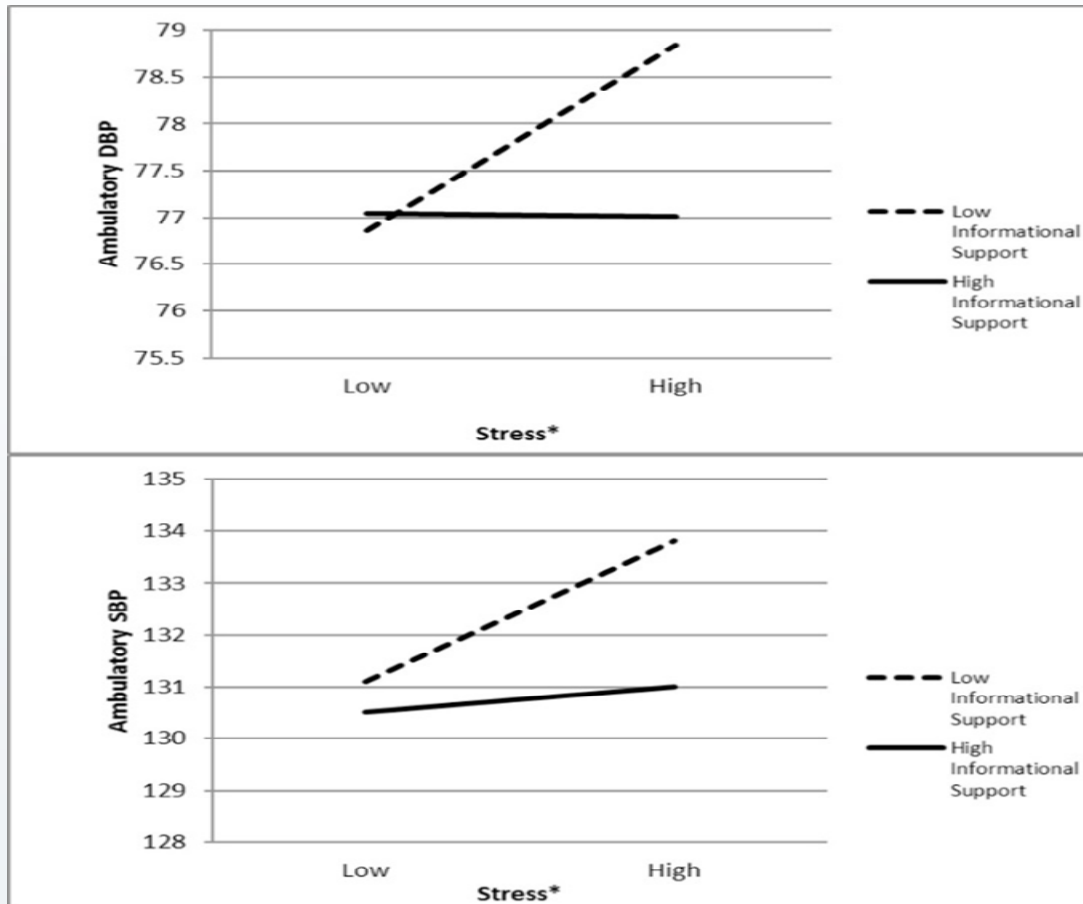
# Positive relations as buffer against stress.



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



# 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 R<sup>2</sup> 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 <sup>2</sup>	OR	95% CI	p	R <sup>2</sup>	OR	95% CI	p	R <sup>2</sup>
<b>SN Quartile, Men</b>												
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	
<b>SN Quartile, Women</b>												
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
<b>Social network level, men</b>						
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
<b>Social network level, women</b>						
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.

\* Statistically significant ( $p < 0.05$ ).

# Social networks and C-Reactive Protein in the NHANES.

	Social network index			
	4: most ties	3	2	0, 1: fewest ties
	OR	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Age 20–59 years (N = 4649)</b>				
Model 1 <sup>a</sup>	1.00	0.93 (0.57–1.52)	1.18 (0.84–1.66)	1.20 (0.79–1.81)
Model 2 <sup>b</sup>	1.00	0.86 (0.53–1.40)	0.96 (0.67–1.38)	0.93 (0.62–1.39)
<b>Age ≥60 years (N = 2323)</b>				
Model 1 <sup>a</sup>	1.00	1.37 (0.88–2.13)	1.74 (1.19–2.55)	2.09 (1.37–3.21)
Model 2 <sup>b</sup>	1.00	1.29 (0.83–2.03)	1.54 (1.04–2.28)	1.80 (1.11–2.92)

OR = odds ratio; CI = confidence interval.

<sup>a</sup>Model 1 adjusted for age and race or ethnicity.

<sup>b</sup>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.

Men

	Social network index			
	4: most ties	3	2	0, 1: fewest ties
	OR	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Age 20–59 years (N = 5423)</b>				
Model 1 <sup>a</sup>	1.00	1.06 (0.80–1.39)	1.03 (0.80–1.34)	1.38 (1.04–1.85)
Model 2 <sup>b</sup>	1.00	1.05 (0.75–1.47)	0.88 (0.65–1.21)	1.22 (0.85–1.76)
<b>Age ≥60 years (N = 2423)</b>				
Model 1 <sup>a</sup>	1.00	1.12 (0.81–1.56)	1.17 (0.78–1.77)	1.15 (0.74–1.79)
Model 2 <sup>b</sup>	1.00	1.06 (0.75–1.49)	1.00 (0.66–1.50)	0.91 (0.57–1.46)

OR = odds ratio; CI = confidence interval.

<sup>a</sup>Model 1 adjusted for age and race or ethnicity.

<sup>b</sup>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.

Women

## **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.