

# **Social relationships & partnership**

Soc-B Module 1: The Biosocial Life Course  
28 Sept- 2 Oct 2020

# 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

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

# Social Capital

Used in two somewhat distinct ways:

- Referring broadly to the entire set of resources derived socially (alongside other forms of capital, eg. economic, cultural).

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

  - Kawachi & Berkman 2015
- Referring to area based social attributes, rather than individual social relationships.
  - Eg. social cohesion – area based perceptions of trust or civic participation.
  - Bonding v Bridging area-level 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.

# 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.

# Functional aspects of social relationships

The **qualitative** dimensions of or resources derived from interactions and relationships. 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.

# Partnership (usually marriage) as a special case

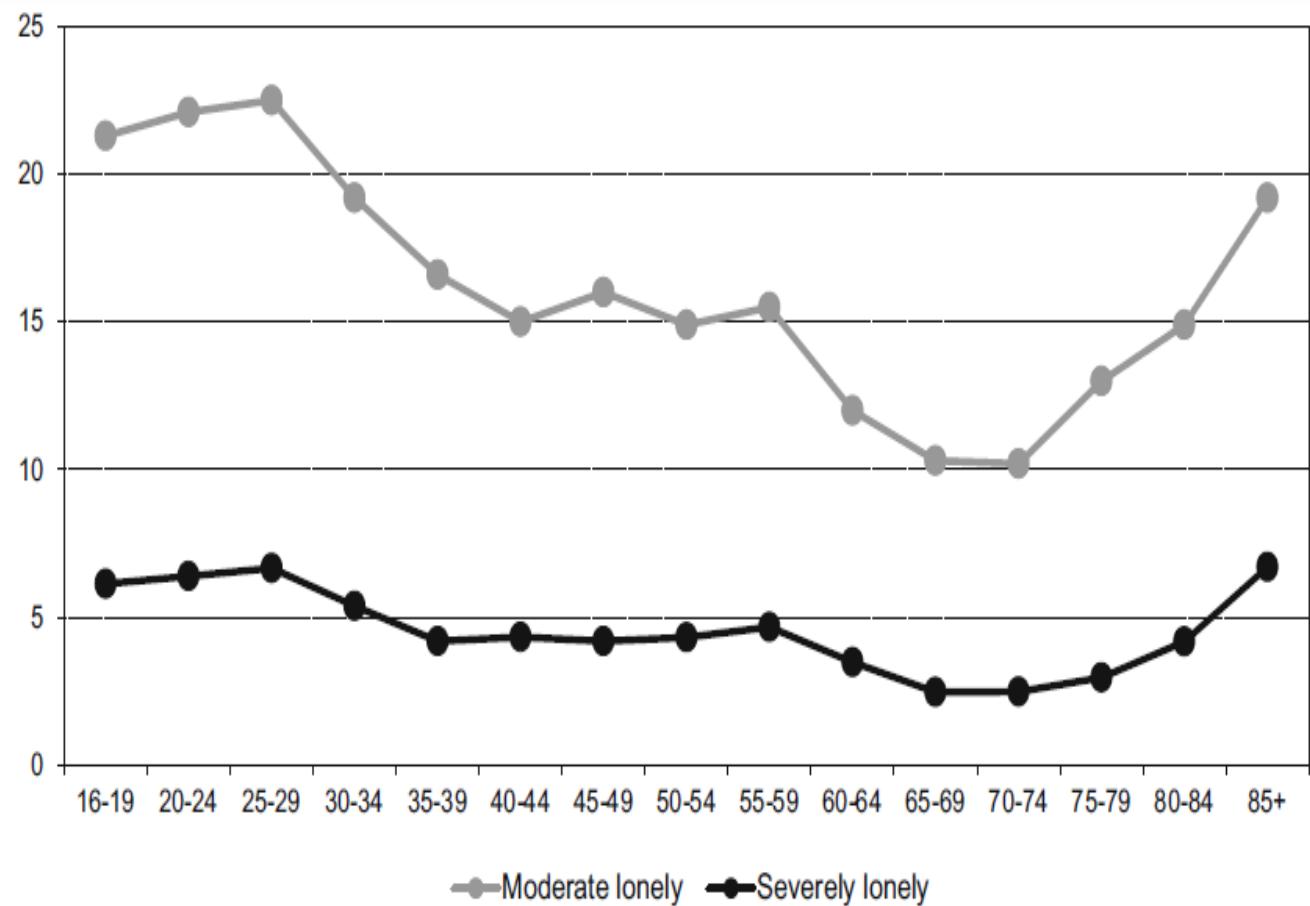
- Main focus on marriage per se, some distinguish differences between cohabiting & married couples, increasing the two are combined.
- Structural & functional dimensions also studied
  - Structural: longitudinal data allows for studies of duration of states, timing & number of transitions.
  - Functional: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

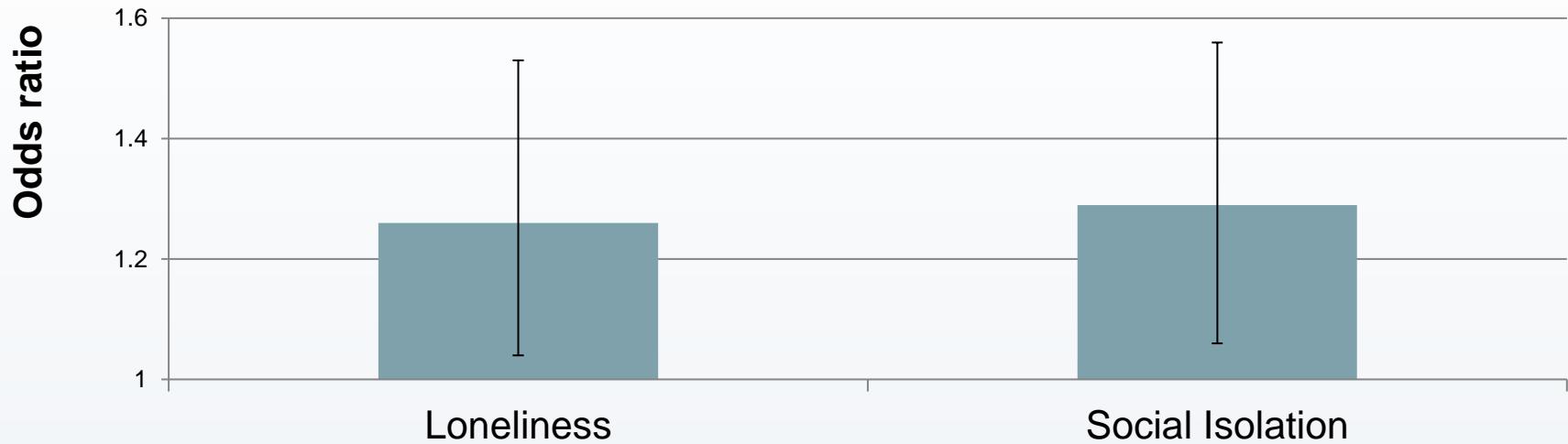
**Study of suicide & social integration**

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

-- *Suicide: a Study in Sociology*

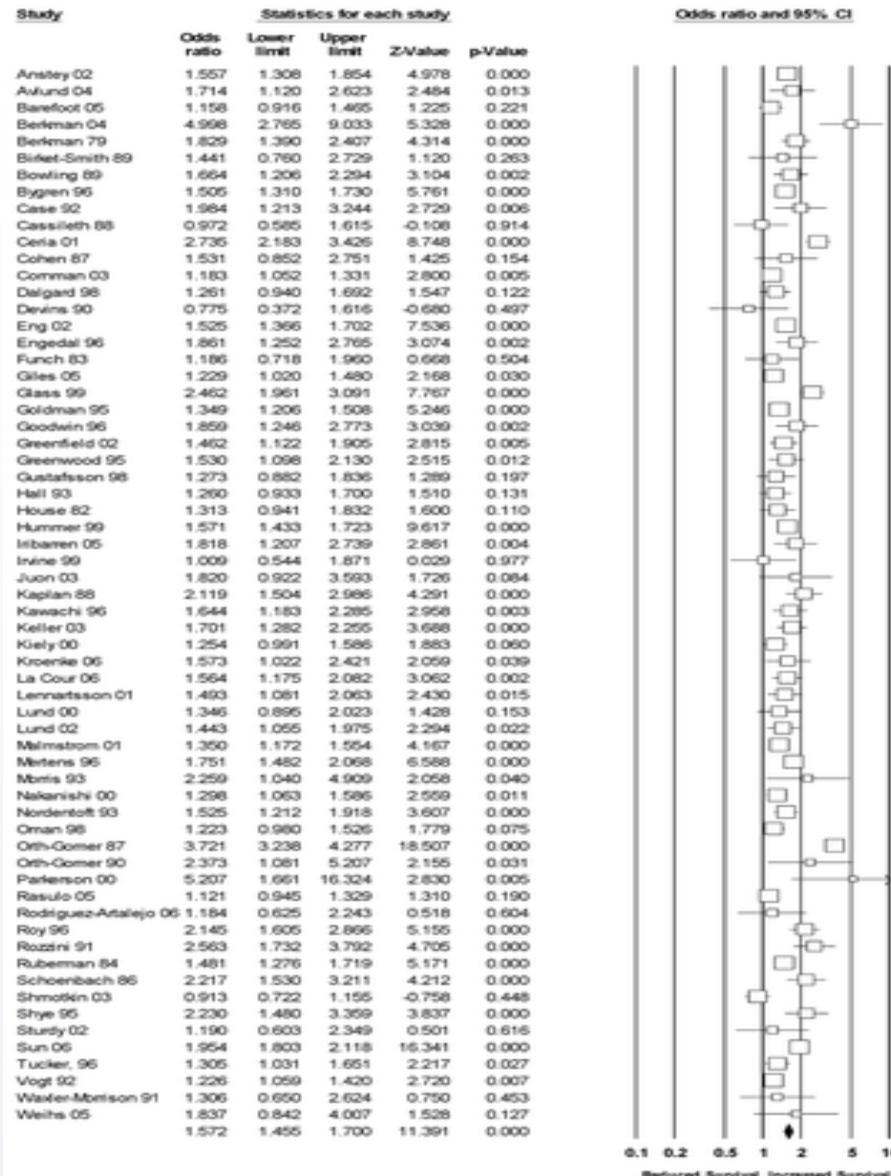
- Suicide rates higher in protestant countries than in catholic countries.
- Social integration – the extent to which individuals are linked to and feel allegiance to social groups.
- Religious groups, family groups and political or nation groups possess the quality of social integration.

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

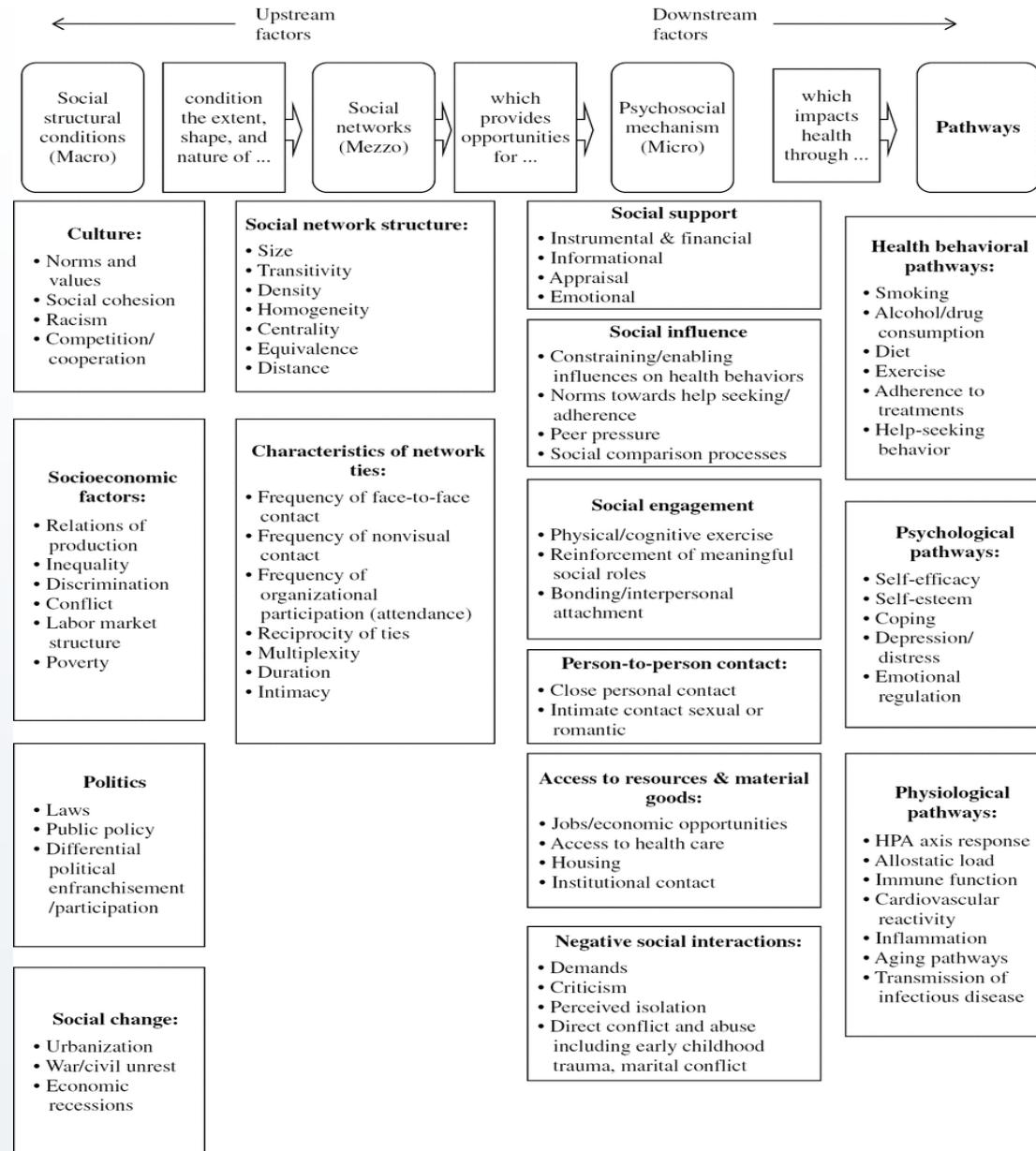


“Current evidence indicates that heightened risk for mortality from a lack of social relationships is greater than that for obesity.”

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



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

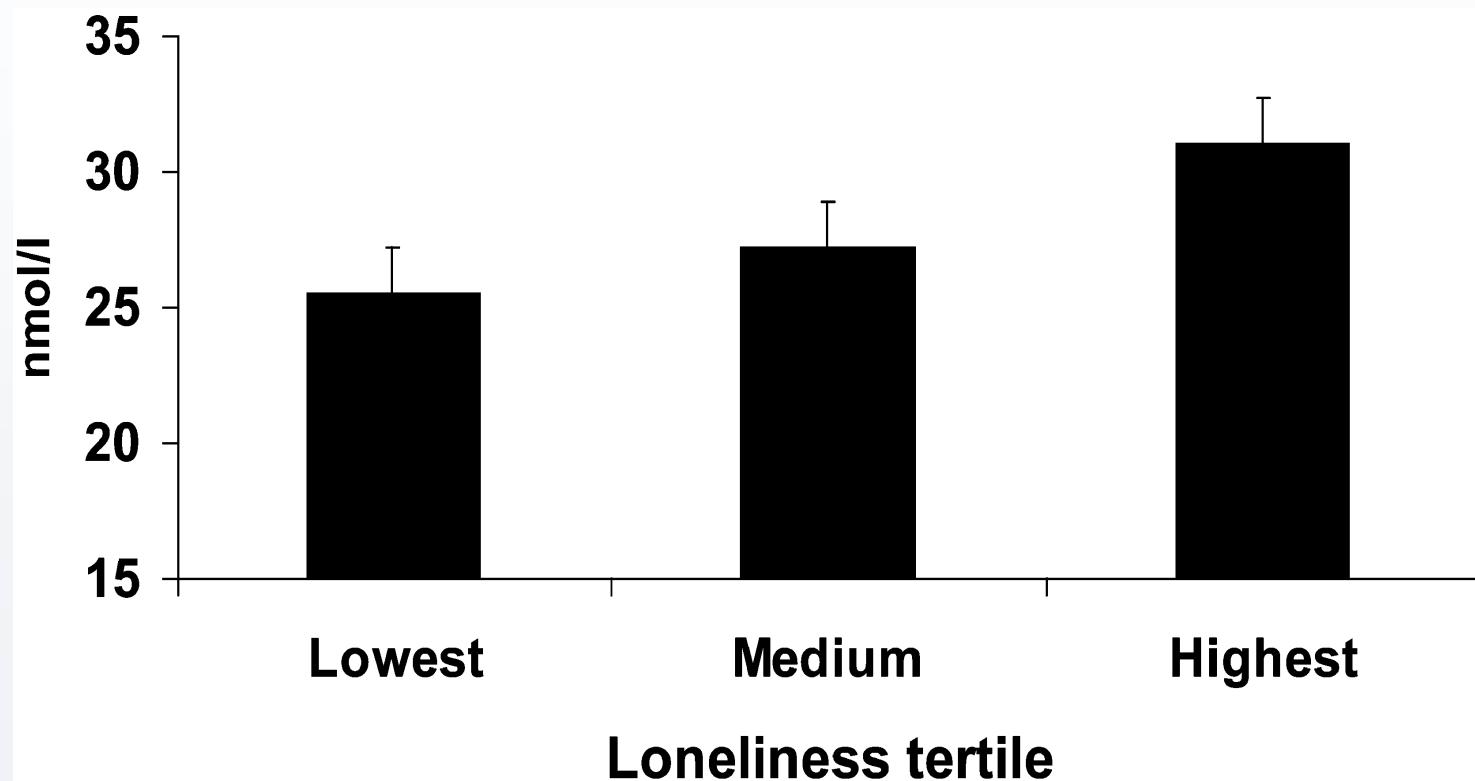


**Chapter:** Social Network Epidemiology

**Author(s):** Lisa F. Berkman and Aditi Krishna

**From:** Social Epidemiology

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



Source: Steptoe et al. PNEC 2004

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

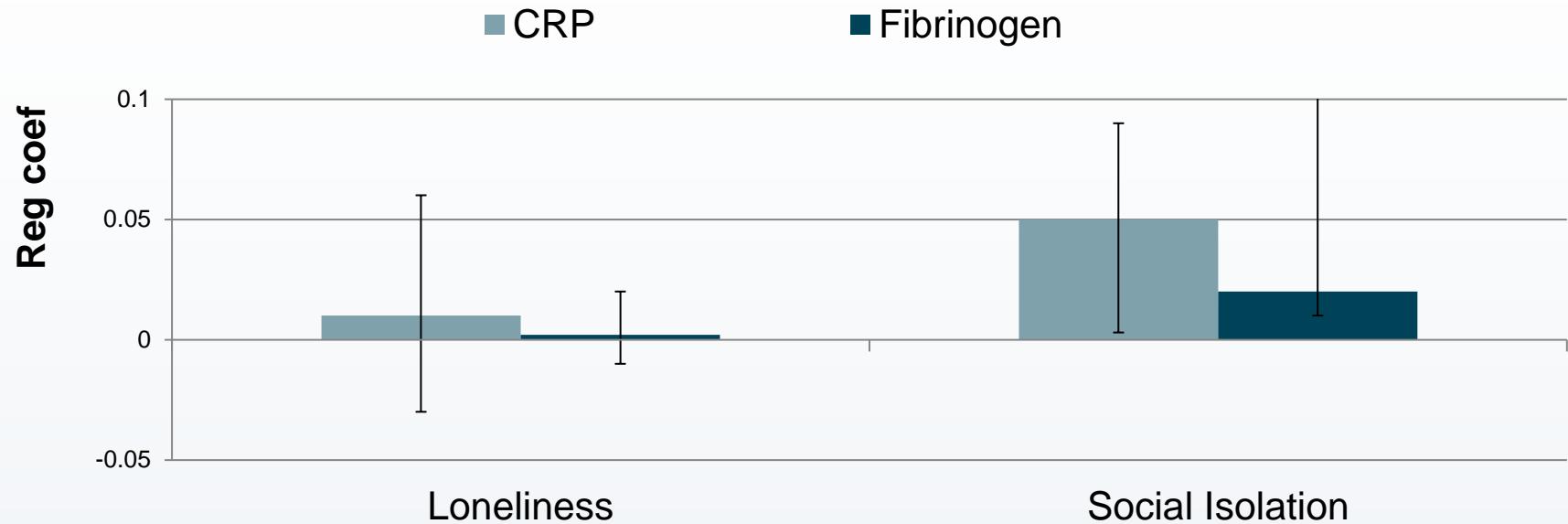
## Association between loneliness and inflammatory markers.

	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.

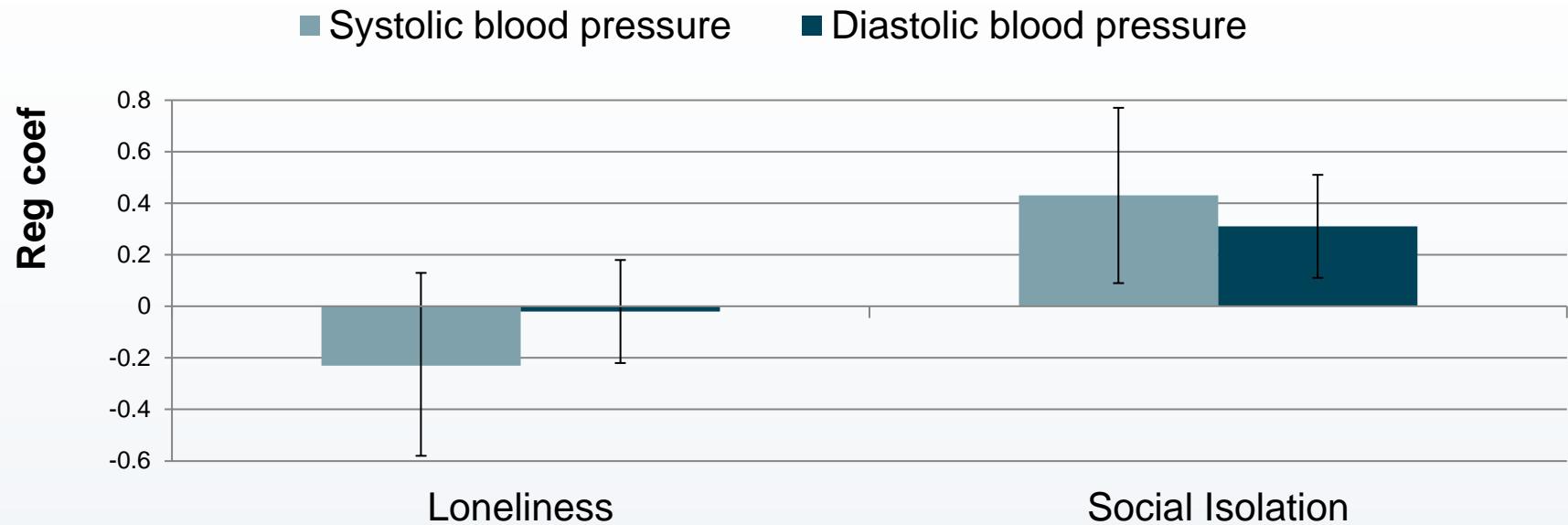
doi:10.1371/journal.pone.0158056.t002

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



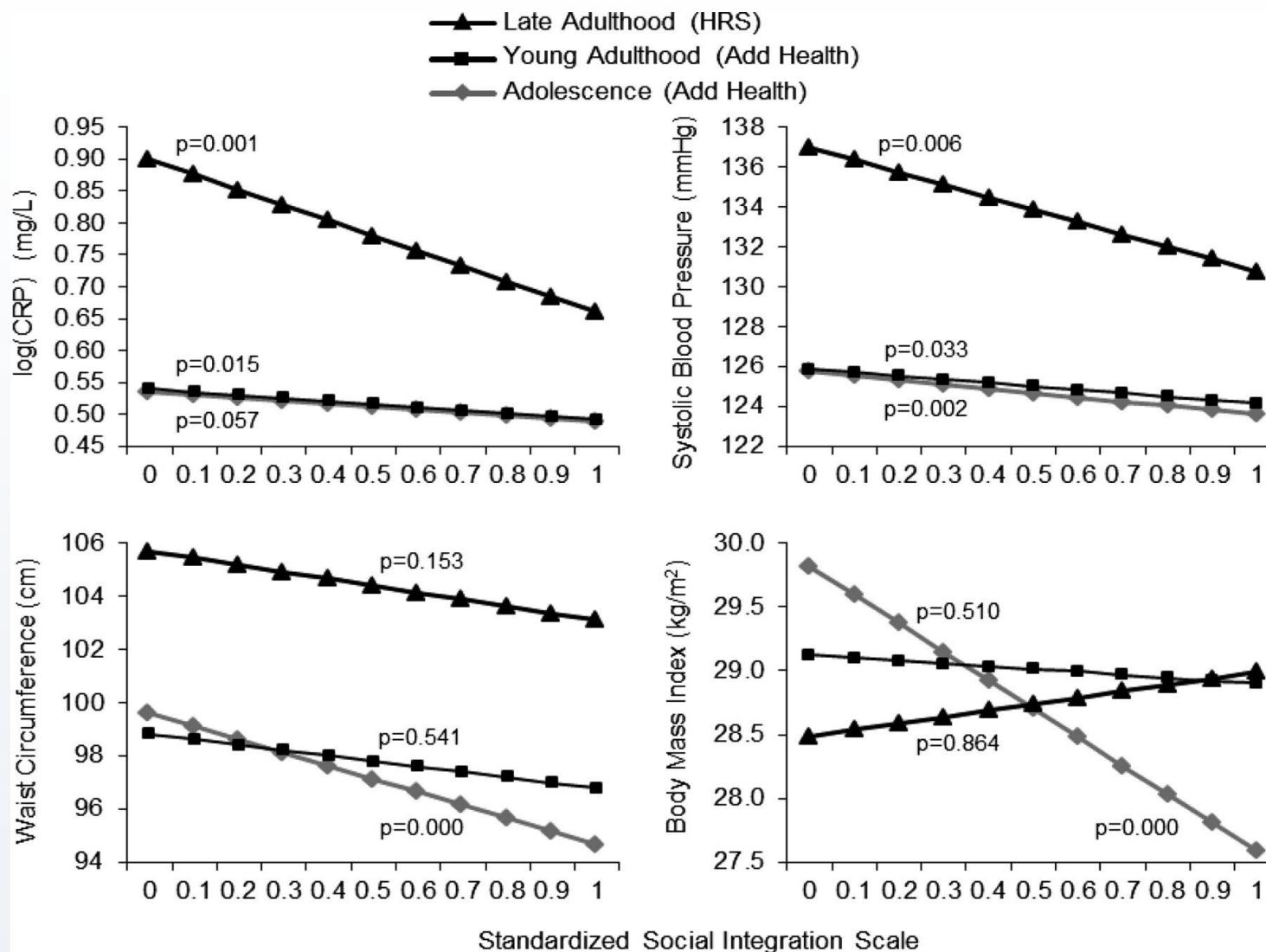
Loneliness & social isolation mutually adjusted + adjusted for age, gender, limiting long-standing illness, depressive symptoms, marital status & wealth.

## 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 from SocB student rotation – Emma Walker, *Brain, Behaviour & Immunity*

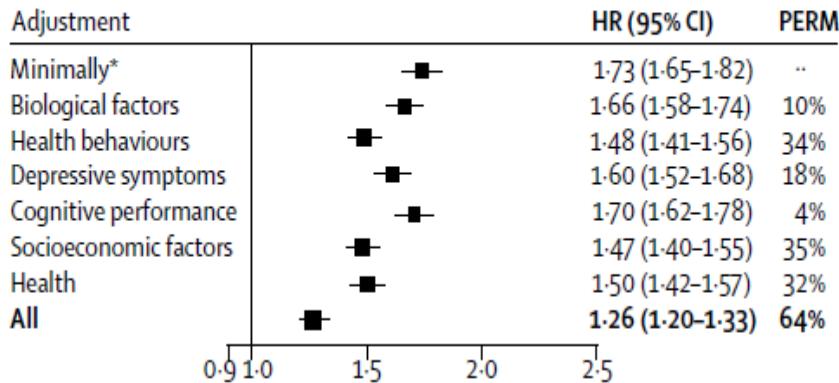
	CRP	Fibrinogen	WBC	IGF-1
Fuly-adjusted*	Coef (95% CI)	Coef (95% CI)	Coef (95% CI)	Coef (95% CI)
Social engagement	-0.01 (-0.02 to 0.001)	<b>-0.01</b> <b>(-0.02 to -0.003)</b>	<b>-0.04</b> <b>(-0.08 to -0.002)</b>	-0.03 (-0.12 to 0.07)
Living with somebody	<b>-0.06</b> <b>(-0.10 to -0.02)</b>	<b>-0.10</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

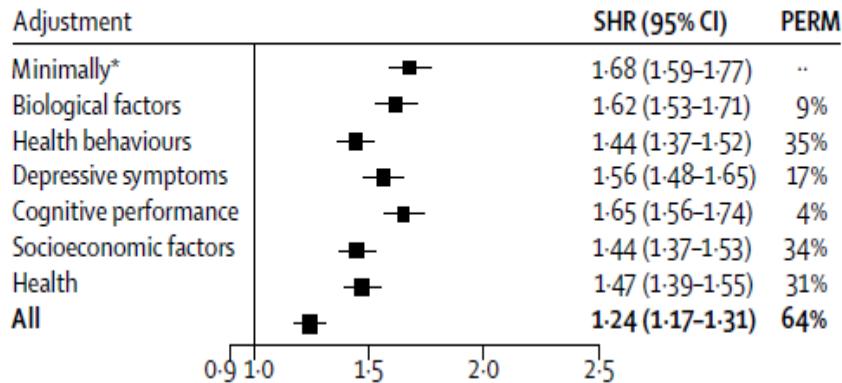
# Mediation in social isolation → mortality

## Social isolation

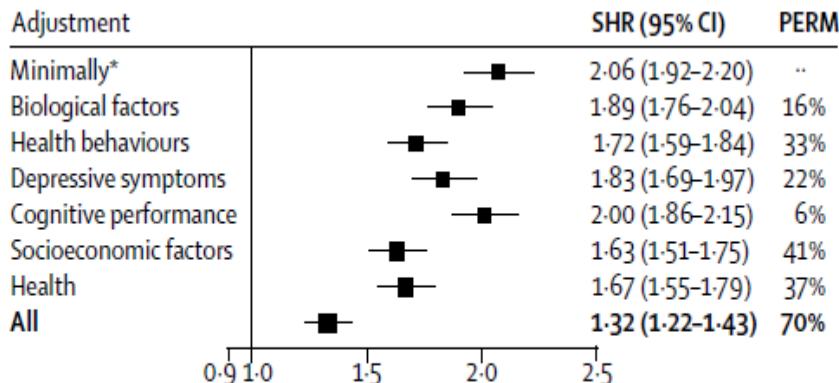
### All-cause mortality



### Circulatory system diseases



### Neoplasms



### Other causes

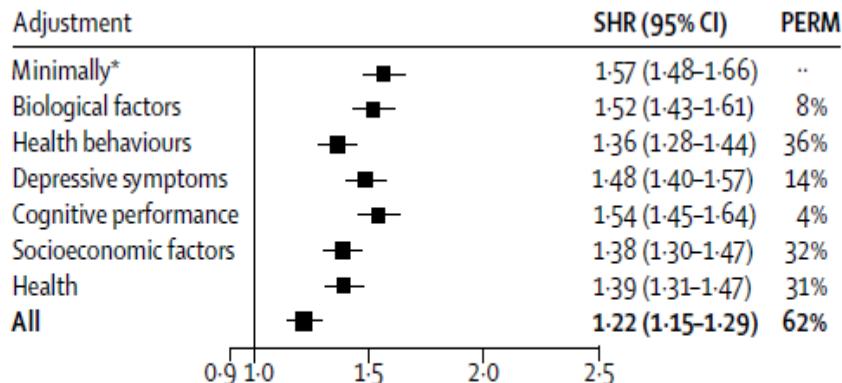
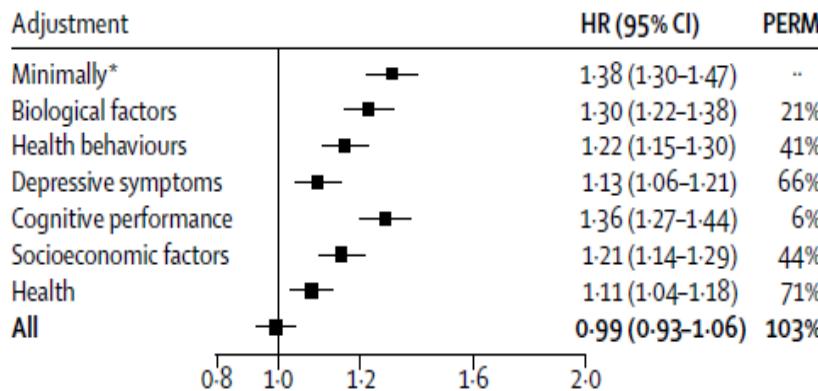


Figure 1: Proportions of the social isolation-mortality association attributable to biological, behavioural, and psychological factors  
 HR=hazard ratio. PERM=percentage of excess risk mediated. SHR=sub-hazard ratio. \*Adjusted for age, sex, ethnic origin, and chronic disease.

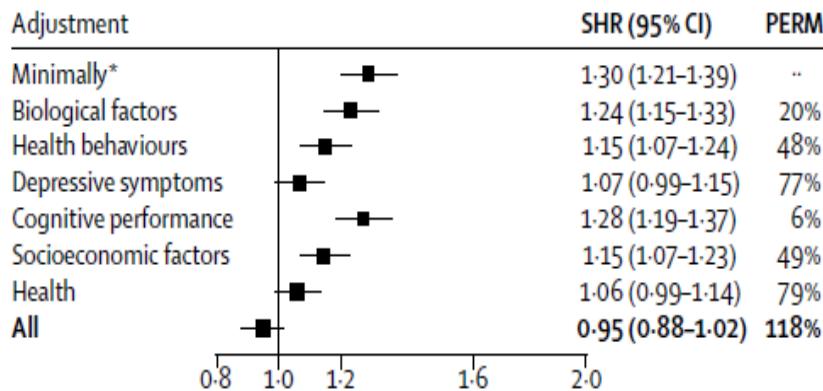
# Mediation in loneliness → mortality

## Loneliness

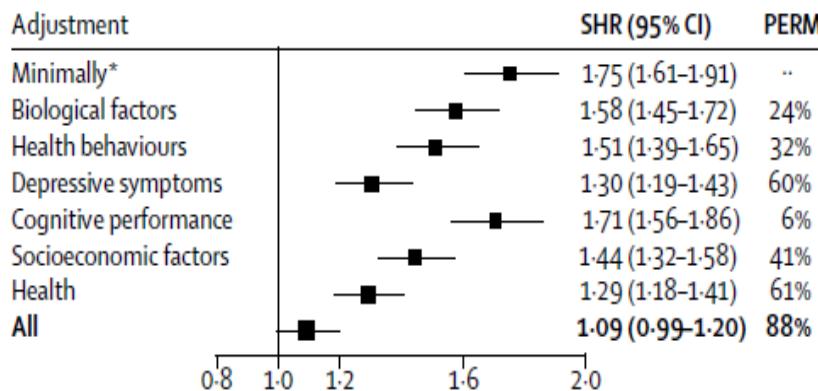
### All-cause mortality



### Circulatory system diseases



### Neoplasms



### Other causes

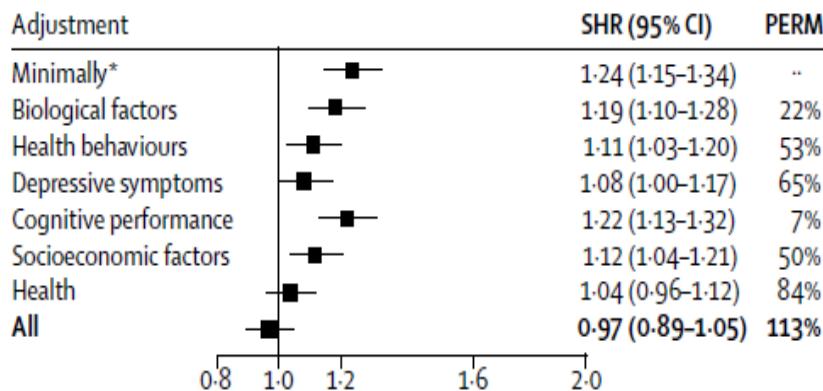
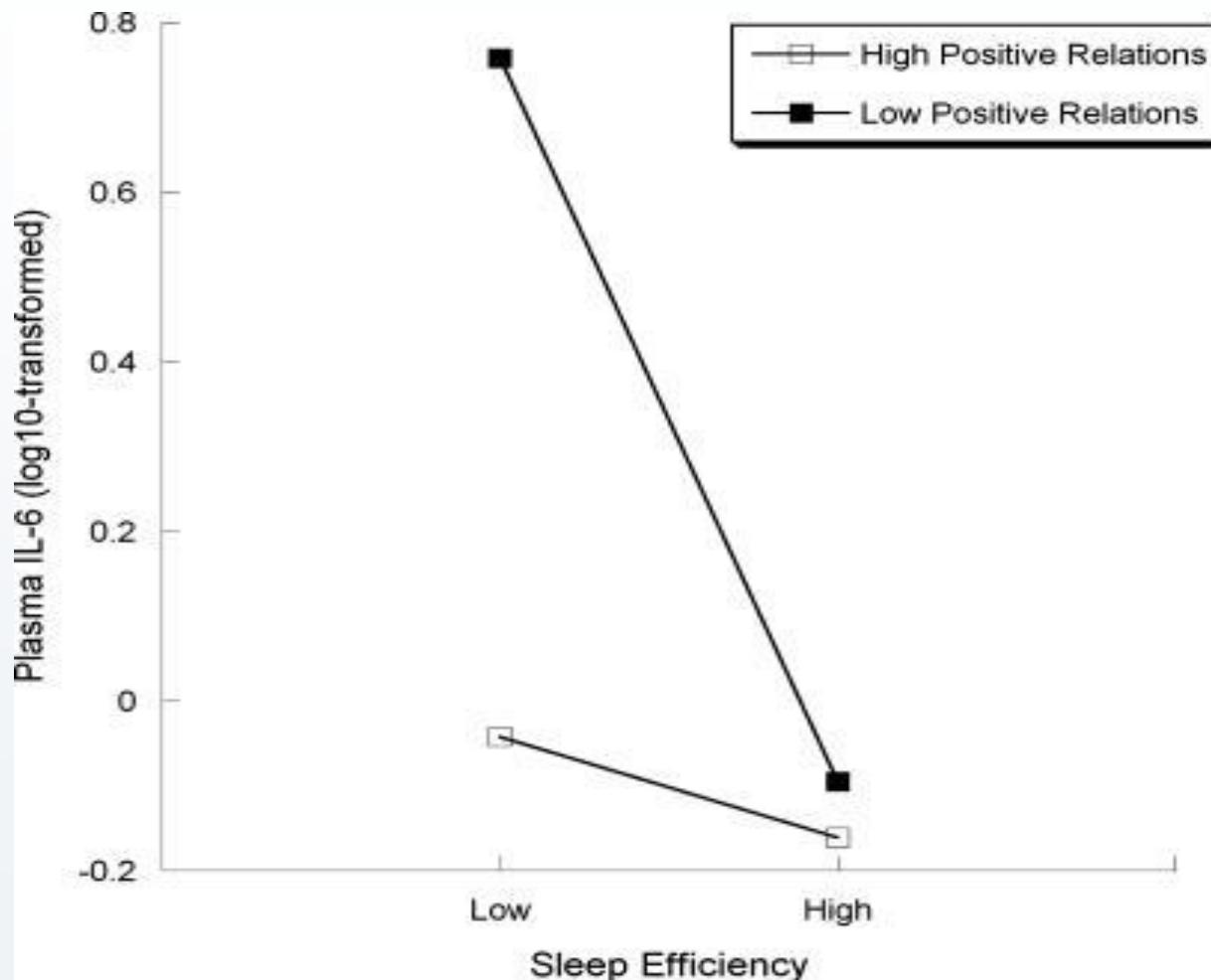


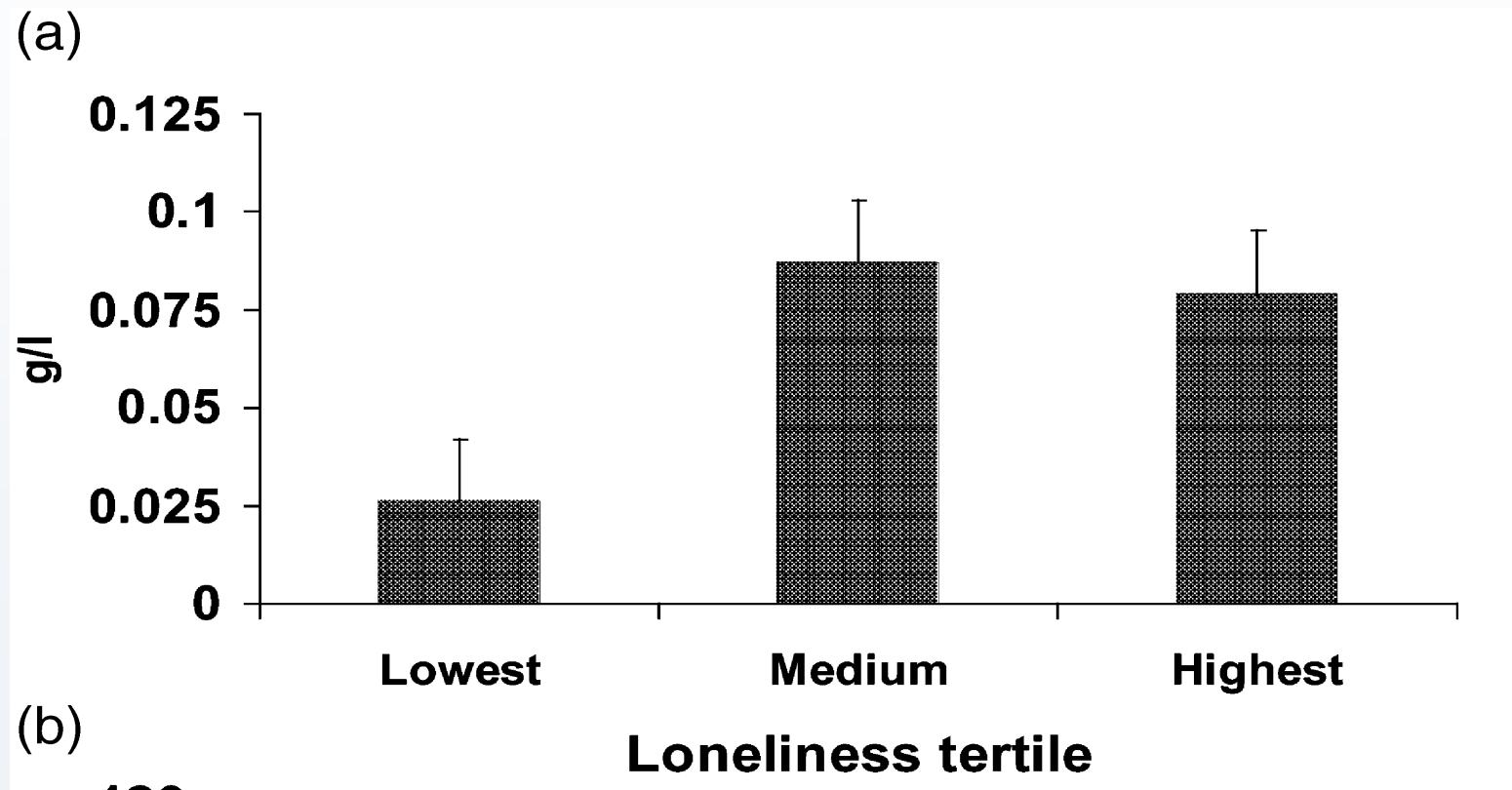
Figure 2: Proportions of the loneliness-mortality association attributable to biological, behavioural, and psychological factors

HR=hazard ratio. PERM=percentage of excess risk mediated. SHR=sub-hazard ratio. \*Adjusted for age, sex, ethnic origin, and chronic disease.

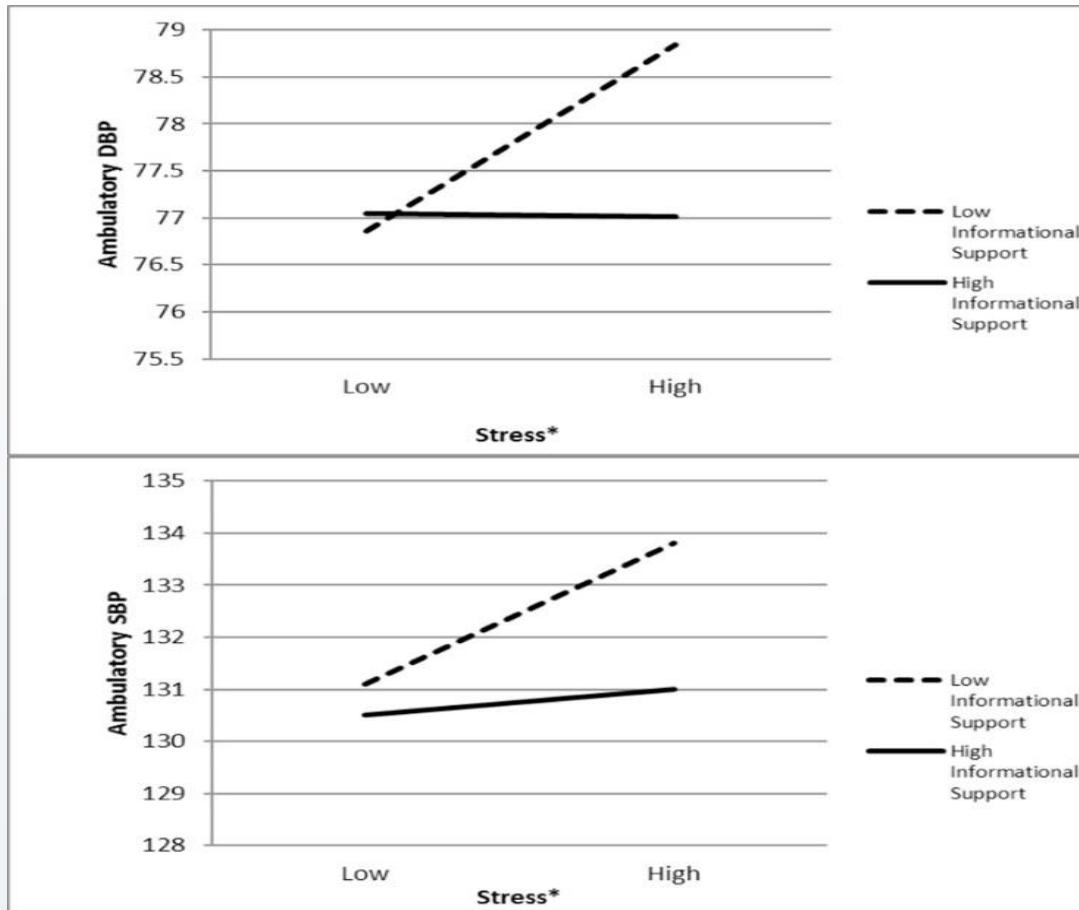
# Positive relations as buffer against stress.



# 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.

# 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  $>3.19 \text{ mg/L}$ ) 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			Social network index				
	4: most ties			4: most ties				
	OR	OR (95% CI)	OR (95% CI)	OR (95% CI)	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)	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	0.86 (0.53–1.40)	0.96 (0.67–1.38)	0.93 (0.62–1.39)	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 = 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)	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	1.29 (0.83–2.03)	1.54 (1.04–2.28)	1.80 (1.11–2.92)	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.

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

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.