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# Family life courses and later life health and mortality

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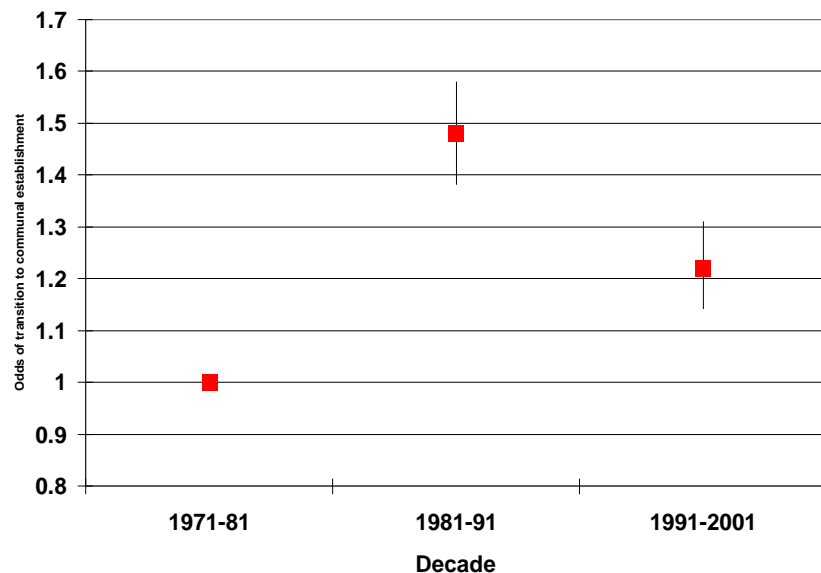
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## Demographic change, intergenerational exchanges and the family, household, kin and social networks of older people

- Household transitions and mortality, including transitions to communal establishments; health of caregivers (Collabs: Dermot O'Reilly, Michael McCann, Michel Poulain, Susan Ramsay).
  - Current and future availability of children for older people in Europe (collab. Cecilia Tomassini and others)
  - Intergenerational exchanges in UK and USA (collab John Henretta)
  - Provision of care for grandchildren and psychosocial health of older Chileans (collab CENEX group).
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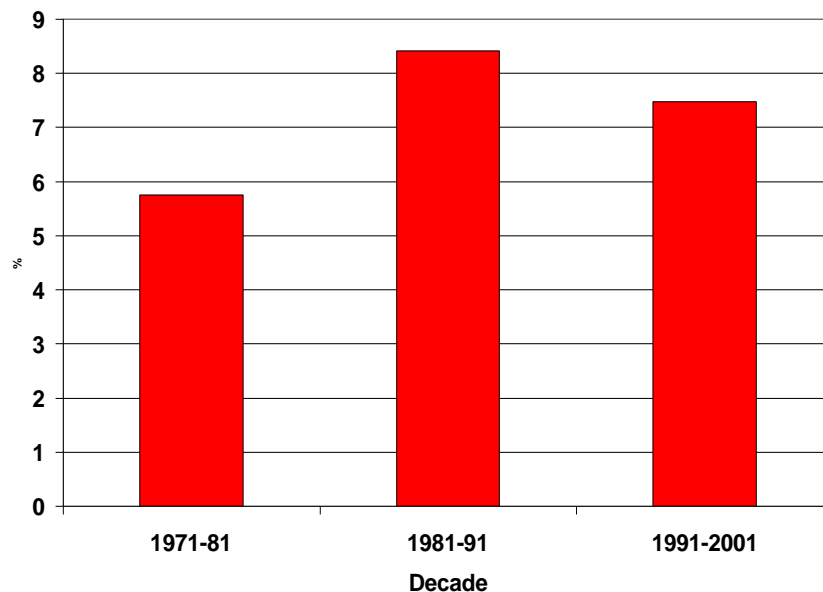
# % aged 65+ who moved from private household to communal establishment between censuses, by decade, E&W

## Odds ratios



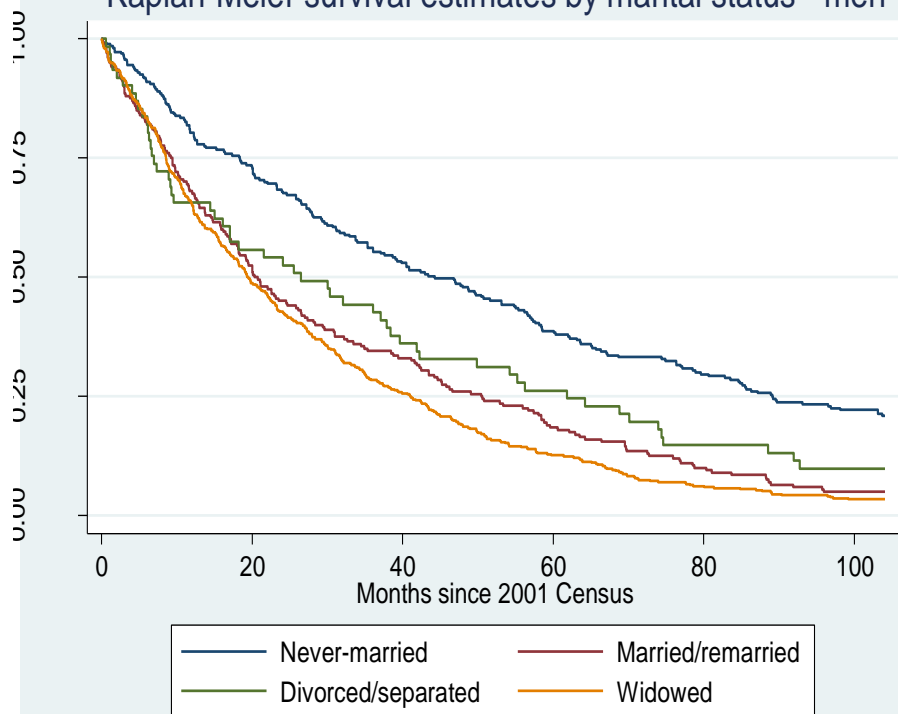
(Controlling for age, sex, marital status & housing tenure)

## %

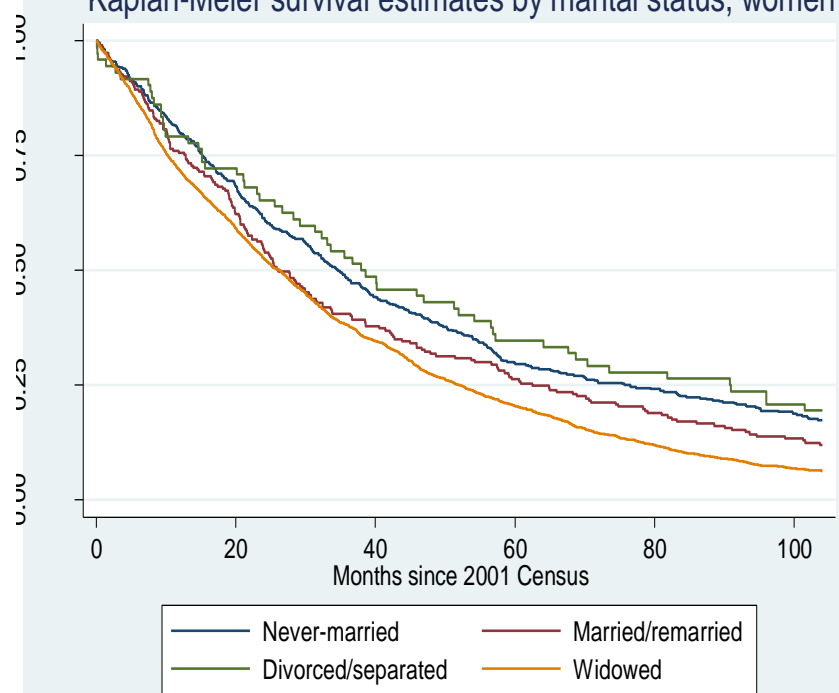


# Survivorship 2001-2008 among men & women in communal establishments by marital status in 2001 and months survived, England & Wales

Kaplan-Meier survival estimates by marital status - men



Kaplan-Meier survival estimates by marital status, women



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## Pathways: Identifying and measuring causal pathways from social to health disadvantage

- Funded by ESRC 2011-2014 as a node of the National Centre for Research Methods. Aims to identify pathways that link socio-demographic circumstances and biological disadvantage to adult health, and parental family and socio-economic circumstances to infant mortality, with a particular emphasis on the mediating factors that lie on these pathways
    - pathways to and from particular fertility histories and their implications for later life health;
    - pathways to and from marital status trajectories and health in mid life;
    - pathways from parental socio-economic and demographic circumstance to birth weight of infants and infant mortality; and
    - use of genes as instrumental variables in causal analysis
  - The **PATHWAYS training programme** includes short courses on
  - Introduction to biomarkers for social scientists
  - Introduction to Genetics for social scientists
  - Causal inference approaches to studying pathways from social disadvantage to health
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**'First known longitudinal investigation of grandparenting and mental health in Chile - - Well-Being and Generativity correlates' (SUSTAIN OCT 2012)**

Grandfathers providing help to grandchildren was associated with the positive indicators of mental health – better life satisfaction for those providing four or more hours per week of time help and higher scores on the mental health component of the quality of life measure for those providing material help. Among grandmothers, however, helping with money was negatively associated with good life satisfaction.

*Grandparenting and psychosocial health among older Chileans: A longitudinal analysis.* Emily M. Grundy, Cecilia Albala, Elizabeth Allen, Alan D. Dangour, Diana Elbourne & Ricardo Uauy. *Aging & Mental Health* Volume 16, Issue 8, November 2012, Pages: 1047-1057. DOI: 10.1080/13607863.2012.692766

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## Trends and differentials in later life health and mortality

- Health inequalities in older European population (WHO Commission on Social Determinants of Health)
  - Differentials between and within European countries in somatic and mental health; which elements of SEP most important (with George Ploubidis)
  - Using multiple coding of cause of death to examine co-morbidity (E&W)
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# Family life courses and health in mid and later life

- Life course influences on later life health are known to be important, but most attention paid to socio-economic (and early life) factors
  - Largely separate literature has shown differences by marital and household status and social support
  - Many studies suggest marriage is protective for health, (social control of behaviours; social support; socio-economic benefits). In the older population are *marital histories* more informative than just current marital status ?
  - Growing literature on associations between the fertility histories of women (and less usually men) and mortality or health – some of hypothesised health benefits similar to those of marriage
  - Several, but not all, studies show worse health/higher mortality for nulliparous and high parity women (and men) and those with early entry to parenthood
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# Childrearing and health:

## **Health promoting:**

- Incentives towards healthy behaviours and risk avoidance
- More social participation and activity
- Role enhancement
- Social support - in childrearing phases and in later life

## **Health challenging:**

- Physiological demands of pregnancy, childbirth and lactation (although reduced risk breast & some other hormonally related cancers)
- Potential role conflict/role overload
- Stress (and depression)
- Economic strain
- Increased exposure infections
- Disruption of careers/education – especially for young parents

Effects, and balance between positive and negative, likely to vary by gender, fertility pattern, and socio-economic & factors, including cultural and policy context. Selection and reverse causation also important.

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## Fertility history and cause specific mortality: hypotheses:

- Expect nulliparity and low parity (one child) to be positively associated with causes of death associated with early poor health and related behaviours (selection), causes related to lack of social control of health behaviours and lack of social support. i.e.all cause groups but particularly alcohol related diseases; lung cancer; accidents and violence; and circulatory and respiratory diseases.
  - Additionally for physiological reasons expect nulliparity and low parity to be positively associated with female mortality from cancers of the breast, ovary and uterus.
  - High parity (4+) – possible adverse effects arising from stress, socio-economic disadvantage and lifestyles offsetting or outweighing benefits of parenthood. If so would expect raised mortality from circulatory diseases and accidents and violence, especially among those of lower education.
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## Fertility and marital history and later life health and mortality: outcomes investigated and data used:

- All cause mortality (and long term illness in ONS LS): ONS Longitudinal Study (E&W); Norwegian population registers; USA Health and Retirement Survey linked to mortality
  - Cause specific mortality: Norwegian population registers
  - Health, health trajectories, mental health: USA HRS; UK British Household Panel Study; English Longitudinal Study of Ageing (allows consideration of mediating variables such as smoking and emotional support), 1946 birth cohort.
  - Quality of life, loneliness, social contacts, receipt of help from children: ELSA
  - Allostatic load and health and limitation and mediation through lifestyle, wealth and social support variables: ELSA
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# The ONS Longitudinal Study of England and Wales

- Census data for individuals with one of four birthdates enumerated at the 1971 Census (c. 1% of population).
  - Census data on other people in LS members' households
  - Maintained through addition of immigrants and new births with LS birth date.
  - Information from later censuses (1981, 91 & 2001) linked in; 2011 data now being added.
  - Linked event data including death of the spouse of sample members, deaths of sample members, births to sample mothers and cancer registrations.
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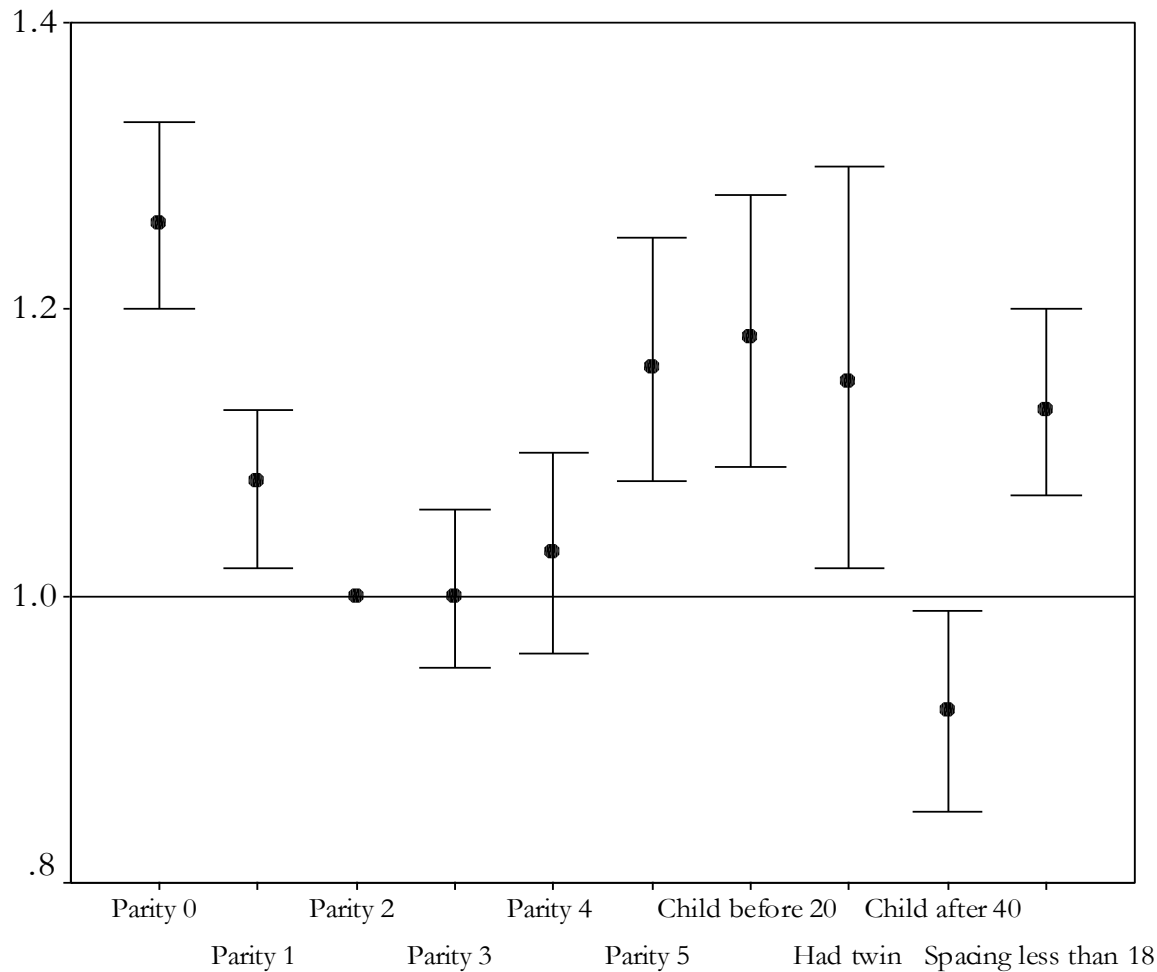
## Fertility history and later life health and mortality of women:

- Female LS members born 1911-1940 (divided into 3 groups) and present in 1971 Census
  - Fertility information comes from:
    - Fertility histories collected from ever married women aged 16-59 in 1971
    - Subsequent linkage of births to sample members
  - Exclusions:
    - Non marital births prior to 1971 (around 4-6%)
    - Post 1971 births where linkage failed (around 8-9%)
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Mortality 1980-2000 of women at ages 50+ by birth cohort and fertility history E&W  
(controlling for age, marital status & socio-economic status)

	Birth cohort		
Ages of death observed	1911-1920 (60-89)	1921-1930 (50-79)	1931-1940 (50-69)
<i>All women: Parity</i>	<i>Odds Ratio</i>	<i>Odds Ratio</i>	<i>Odds Ratio</i>
0	<b>1.13</b>	<b>1.22</b>	<b>1.28</b>
1	<b>1.06</b>	<b>1.04</b>	<b>1.10</b>
2 (ref)	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>
3	<b>1.01</b>	<b>0.99</b>	<b>1.01</b>
4	<b>1.05</b>	<b>1.01</b>	<b>1.11</b>
5+	<b>1.14</b>	<b>1.12</b>	<b>1.25</b>
<b>Parous women</b>			
Had a child before 20	<b>1.15</b>	<b>1.15</b>	<b>1.30</b>
Had a child after 39	<b>0.93</b>	<b>0.89</b>	<b>0.94</b>
Had a birth interval < 18 months	<b>1.19</b>	<b>1.00</b>	<b>1.08</b>
Had twins	<b>1.13</b>	<b>1.13</b>	<b>1.19</b>
Number of deaths	<b>18495</b>	<b>8622</b>	<b>2212</b>
<i>Analysis of ONS LS data in Grundy &amp; Tomassini, 2005</i>		<i>P&lt;0.05</i>	

# Odds ratios and 95% confidence intervals, from event history model of mortality between ages 50 and 70; Women in ONS LS



Results from fully adjusted models controlling for age, year, marital status, & SES.

Source: Analysis of ONS Longitudinal Study data in Grundy & Tomassini, *Soc Sci Med* 2005

## Differentials in mortality 1991-2001 and limiting long-term illness in 1991 by parity, women aged 60-79 in 1991

Parity	Mortality 1991-2001 (Rate ratio)	Long-term illness 1991 (Odds ratio)
0	1.16*** (1.09-1.22)	1.05 (0.98-1.13)
1	1.09** (1.09-1.22)	1.08* (1.02-1.15)
2 (ref.)	1.00	1.00
3	1.01 (0.96-1.13)	1.06 (0.99-1.13)
4	1.05 (0.97-1.13)	1.05 (0.96-1.15)
5+	1.14** (1.06-1.23)	1.24***(1.14-1.36)
N (deaths)	12,254	41,341

Controlling for marital history and socio-economic indicators

Analysis of ONS LS, Grundy & Tomassini *BMC Public Health*, 2010. \*P<0.05; \*\*<0.01, \*\*\*<0.001



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## Marital and fertility history and health: Results from ONS Longitudinal Study

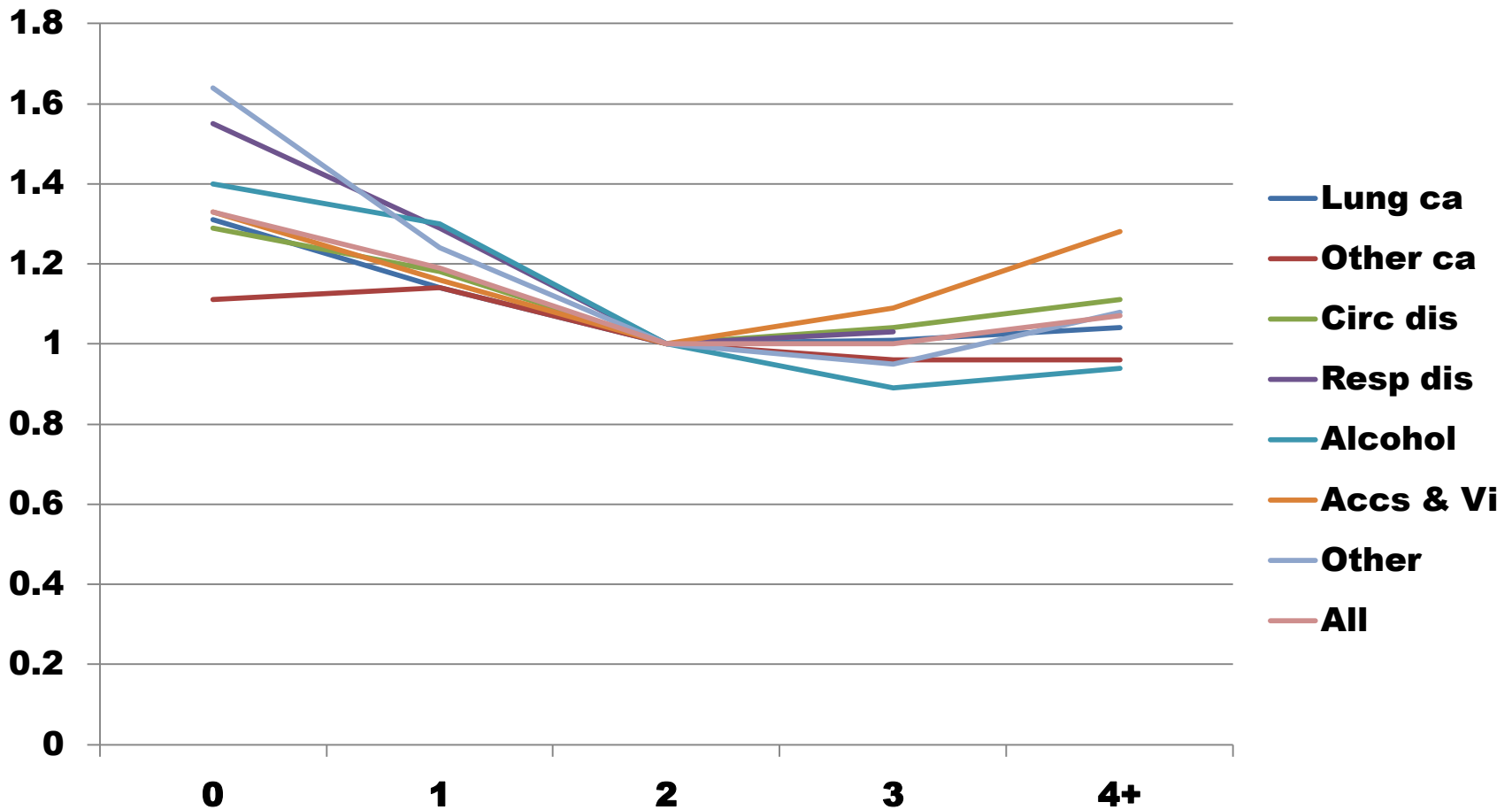
- Results show the expected advantages in terms of mortality (and health) for those in long term first marriages.
  - Worse health/mortality for those in long-term remarriages (selection effect? – these are people divorced or widowed and remarried before age 40-59).
  - Higher mortality for unmarried groups; however differences *among* divorced and widowed by timing of divorce/widowhood inconsistent.
  - Higher mortality (and worse health) among nulliparous and high parity women, even after allowance for marital history & SES.
  - Early childbearing also associated with higher mortality risks later in life
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# Fertility history and later life all cause mortality:

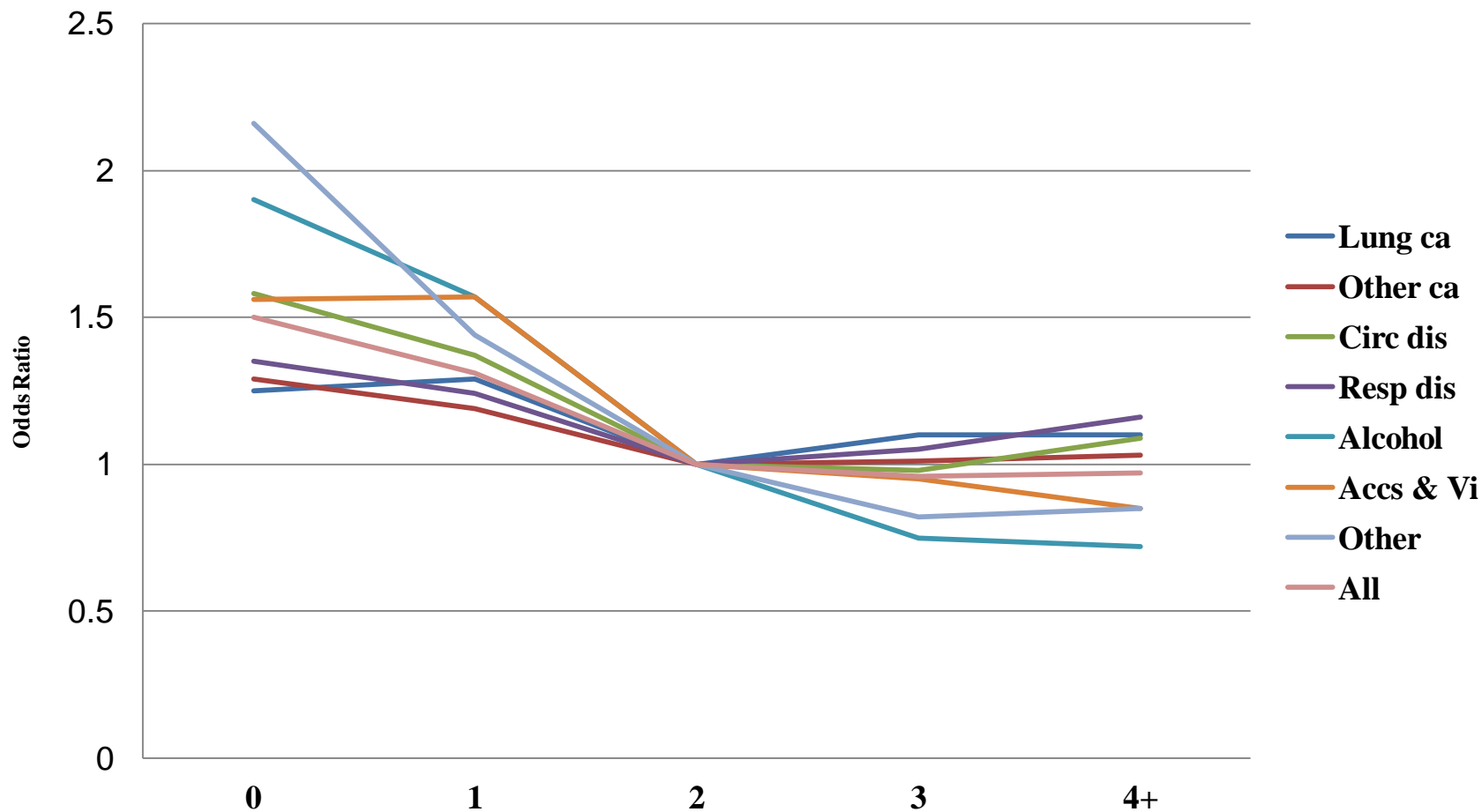
- E&W, USA and Norway women: higher mortality for nulliparous and (Norway, cohort born 1910-20 E&W) parity 1.
  - Norway (and US) similar results men.
  - E&W (and US) also higher mortality for high parity women and men – but no or negative association Norway
  - All countries apparent lower risk old parents (selection?)
  - All countries apparent higher risk for young parents- including in Norway when parental education controlled – other antecedent characteristics?
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# Associations between parity and mortality by cause group, Norwegian men aged 45-68



Controlling for age, year, education, marital status, region, log population size of municipality (Model 3), Source: Grundy and Kravdal *Soc Sci Med* 2010

# Associations between parity and mortality by cause group, Norwegian women aged 45-68



Controlling for age, year, education, marital status, region, log population size of municipality (Model 3): Source Grundy and Kravdal, *Soc Sci Med* 2010.

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## Conclusions from cause specific analysis

- Results support hypothesis that nulliparity and low parity associated with lack of social control of health related behaviours, lack of social support and adverse selection
  - Results for female cancers also as expected, consistent with physiological causes – but also social support
  - Limited support for hypothesis that stress of high parity might outweigh beneficial effects (once age at 1<sup>st</sup> birth and education controlled) **but** in stratified analyses high parity increased risks of circulatory disease mortality for low SES men; results may differ in countries offering less support for parents
  - Gender difference in associations between high parity and mortality from accidents and violence – possibly due partly to gender differences in co-residence with children (not measured here)
  - Need analyses including data on support exchanges, perceived and measured stress and health related behaviours.
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Fertility history, health status and health trajectories: *Analysis of the BHPS.*

- Analysis of associations between fertility histories of women and men with both level and change in two indicators of health
  - Sample drawn from British Household Panel Study; 3,450 women and men born 1923-1950 who responded to the 1992 wave, were followed up to 2003 and were then aged 53-80.
  - Methods: Multiprocess modelling of retention in sample and health outcomes conditional on retention.
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# BHPS analysis: key findings

- High parity (4+ children) associated with health limitation and worse self-rated health among women and men (health measured over 11 years)
  - Slightly higher risk of health limitation for childless women
  - Early parenthood for parous) and short birth intervals (among those with 2+ children) associated with higher risk of health limitation, worse self rated health and faster accumulation of health limitation
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## BHPS analysis: Results for a) parous men & women and b) parous with 2+ children

		Health limitations		Self-rated health	
		Men	Women	Men	Women
a) Parous respondents:					
	Number of children:				
	1			+	
	3				
	4+	+++	+++	+++	+++
	Birth before 23/20	+++	+++	+++	++
	Birth after 39/35				
b) Parity 2+; spacing effects					
	Number of children:				
	3	+			
	4+	+++	+++	+++	
	Birth before 23/20	++	+++	+++	+++
	Birth after 39/35				
	Birth interval < 18 months	++	+++	+++	+++

Source: Read, Grundy, Wolf, Pop Studies 2011.



# Limitations of previous work and new approaches

## Limitations of previous work

- Outcome measures – mortality and health limitation- may be too far ‘upstream’ and do not tell us about *changes* in health
- Failure to identify PATHWAYS through which fertility histories influence later life health (and no relevant data in census based or register data)
- Limited consideration of early life influences on both fertility histories and later health

## Addressing these limitations

- Analyse health *trajectories* (BHPS)
- Measures of allostatic load in mid and later life (ELSA)
- SEM and path analysis to identify *pathways* from fertility histories to later life health (and mediation via allostatic load) and examine the extent to which associations operate through (i.e. are mediated by) wealth, health related behaviours, and social support and strain
- Modelling including early life indicators

# Data and Methods



- English Longitudinal Study of Ageing (ELSA) waves 1 -3 (2002-2006)- nationally representative survey
- Socio-demographic information and self reported health collected in all waves
- Detailed health data including biomarkers collected in alternate waves –biomarker data used to derive an index of allostatic load
- Retrospective life course data collected in wave 3.
- Path models within structural equation modelling framework using Mplus version 5.21. Maximum likelihood estimation with robust standard errors. Mplus deals with missing data using all available data under MAR assumptions.

## **Demographic & life course:**

Age; education; childhood health problem (retrospective); married/not married; co-residence with children (time varying); ever divorced; ever widowed; (wave 3).

## **Fertility measures:**

Number of natural children (0, 1,2,3,4+); any step child; any adopted child; deceased child; for parents: young (<20/23) age first birth; late age last birth (>34/39).

## **Intermediate**

Wealth; smoking; physical activity; social support and strain  
(wave 1)

**Outcomes:** Allostatic load (wave 2); self reported health limitation  
(wave 3).

# Allostatic load scores in ELSA



- **Allostatic load:** multisystem physical dysregulation resulting from long-term exposure to stress
- Grouped allostatic load index: number of biomarkers indicating high risk (25th percentile) calculated separately for men and women (and age group), range 0 – 9; higher = worse.

Upper 25 <sup>th</sup> percentile	Lower 25 <sup>th</sup> percentile
Systolic blood pressure	Diastolic blood pressure
Fibrinogen	Peak expiratory flow
Triglycerides	
C-reactive protein	
Glycated HgB	
Waist-hip ratio	
Total/HDL cholesterol ratio	

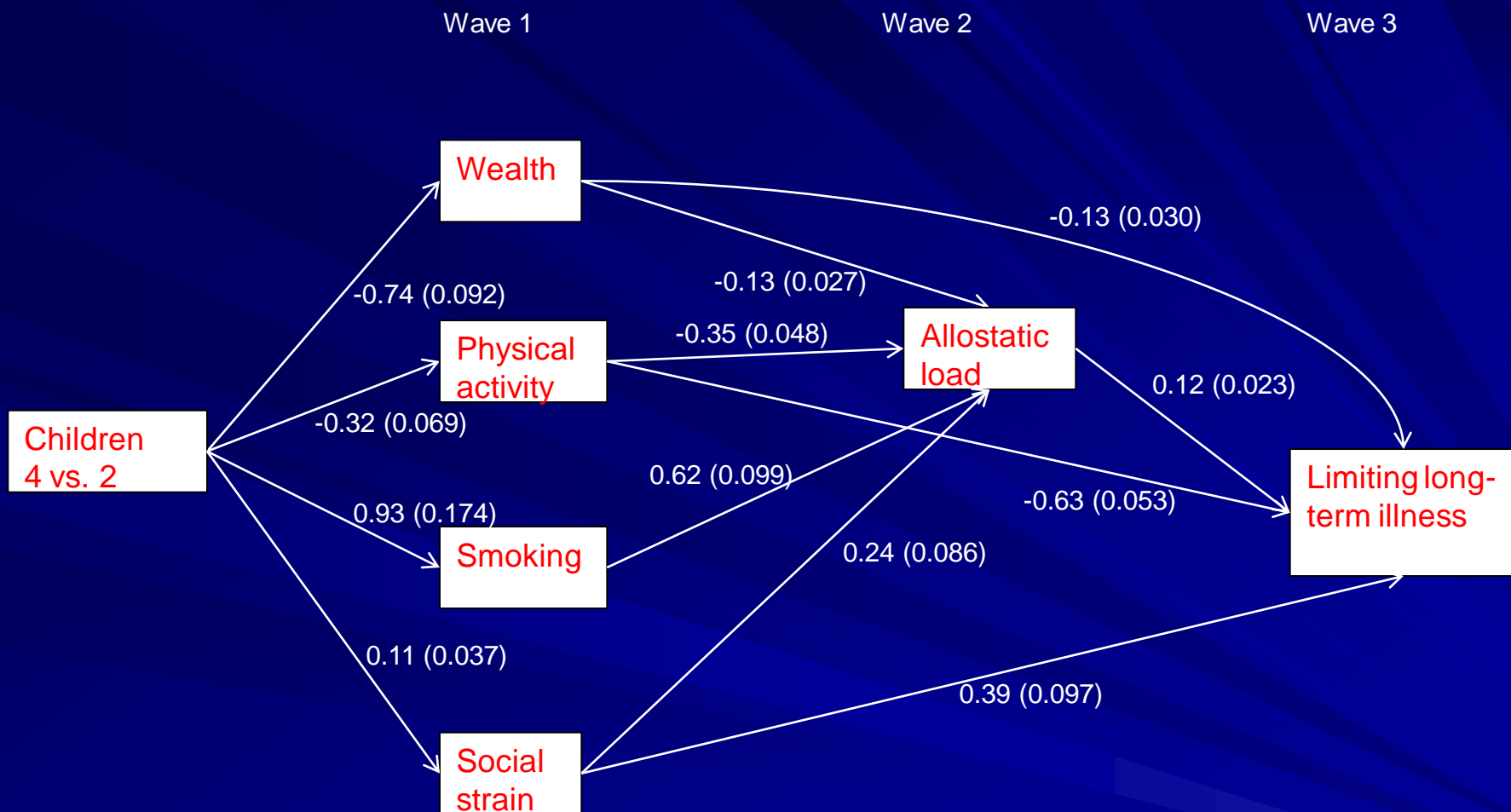
Associations between fertility & parenthood variables, allostatic load and health limitation among men (n=2071) and women (n=2519) in ELSA



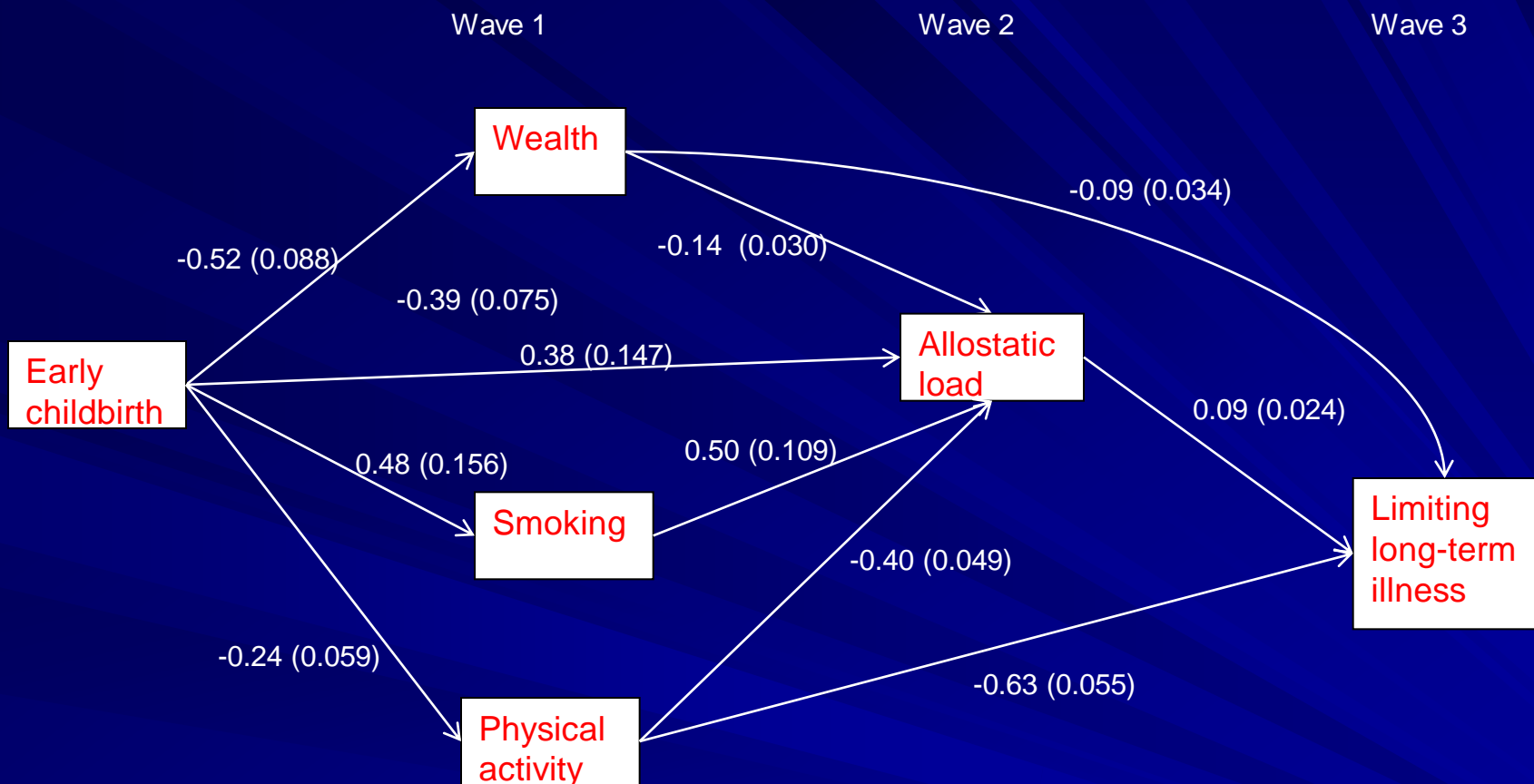
Fertility & parenthood	Allostatic load, 2004 (higher=worse)		Health limitation, 2004	
	M	F	M	F
Number of natural children				
0	-0.05	0.04	0.10	0.18
1	0.04	-0.14	0.14	0.07
3	0.01	0.18	0.07	-0.01
4	0.34*	0.29*	0.29*	0.23*
Child at age <20 (F), <23 (M)	0.51***	0.58***	0.46***	0.43**
Child at age >34(F), >39 (M)	0.10	-0.16	0.29*	-0.23*
Adopted child	-0.15	0.55**	-0.24	0.09
Step child	0.08	0.03	0.30*	-0.09
Child died	0.22	0.03	0.21	0.19

Models include health in childhood; age; education; married/not married; ever widowed; ever divorced; intergenerational contact. Allostatic load adjusted for fasting & inhaler use. Models including age at parenthood or death of child exclude childless sample members.

\*P<0.05; \*\*<0.01, \*\*\*<0.001



Path model for all men in ELSA. Model adjusted for age, education, being married, ever divorced, ever widowed and childhood health. Significant paths are shown (unstandardized estimate and standard error).



Path model for parous women in ELSA. Model adjusted for age, education, being married, ever divorced, ever widowed, childhood health, and coresidence with child. Significant paths are shown (unstandardized estimate and standard error).

# Conclusions & Discussion

- Association between large family size and allostatic load and health is mediated largely by wealth (M&F), and smoking and social strain (F) – i.e. no direct association once all intermediate factors entered in model
- Mothers – still a direct association between early motherhood and allostatic load, but otherwise associations mediated by wealth, physical activity and smoking.
- Among fathers, direct effects remain to some extent, although some mediated by wealth and physical activity.
- Some effects on health mediated by allostatic load, but not all
- So, as hypothesised, biosocial pathways from parenthood history to health include economic, social support and health related behaviours – need now to examine in more detail pathways to particular fertility trajectories – especially childhood SES and broader environmental influences (e.g. support from the state).
- Implications of changing fertility patterns?



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# So are children the key to a healthy and happy old age?

## Yes

- More children and having a daughter increases social contacts
- More children associated with more help from children; parents have lower risks of entry to nursing homes
- Parents (of smallish families) have lower mortality, better health and better cognition than the childless

## No

- High parity associated with higher mortality and worse health – but not in Norway
- ‘Intensive’ family formation patterns – early parenthood and short birth intervals- associated with worse physical and mental health, faster decline in health, and raised mortality

**BUT the context is very important –variations and interactions by gender, country, education etc AND we need to consider selection.**

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Additional slides for questions

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## Event Data in the LS (added every year)

Deaths (cause specific)

Widow(er)hoods

Cancer Registrations

Live and stillbirths to  
Sample Mothers

Births of LS Members

Infant and child deaths to  
Sample Mothers

Emigrations (recorded)

Immigrations

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# Census Data in the LS (measured every ten years)

## **All censuses**

Marital status & family type

Housing and amenities

Migration & travel to work

Economic activity

Occupation & social class

Ecological (area level) data

## **Since 1991/2001**

Ethnicity

Education

Religion

Caregiving

Self-rated health

Long-term illness

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**Data for LS members and other members of their households**