The changing association between maternal age and offspring well-being
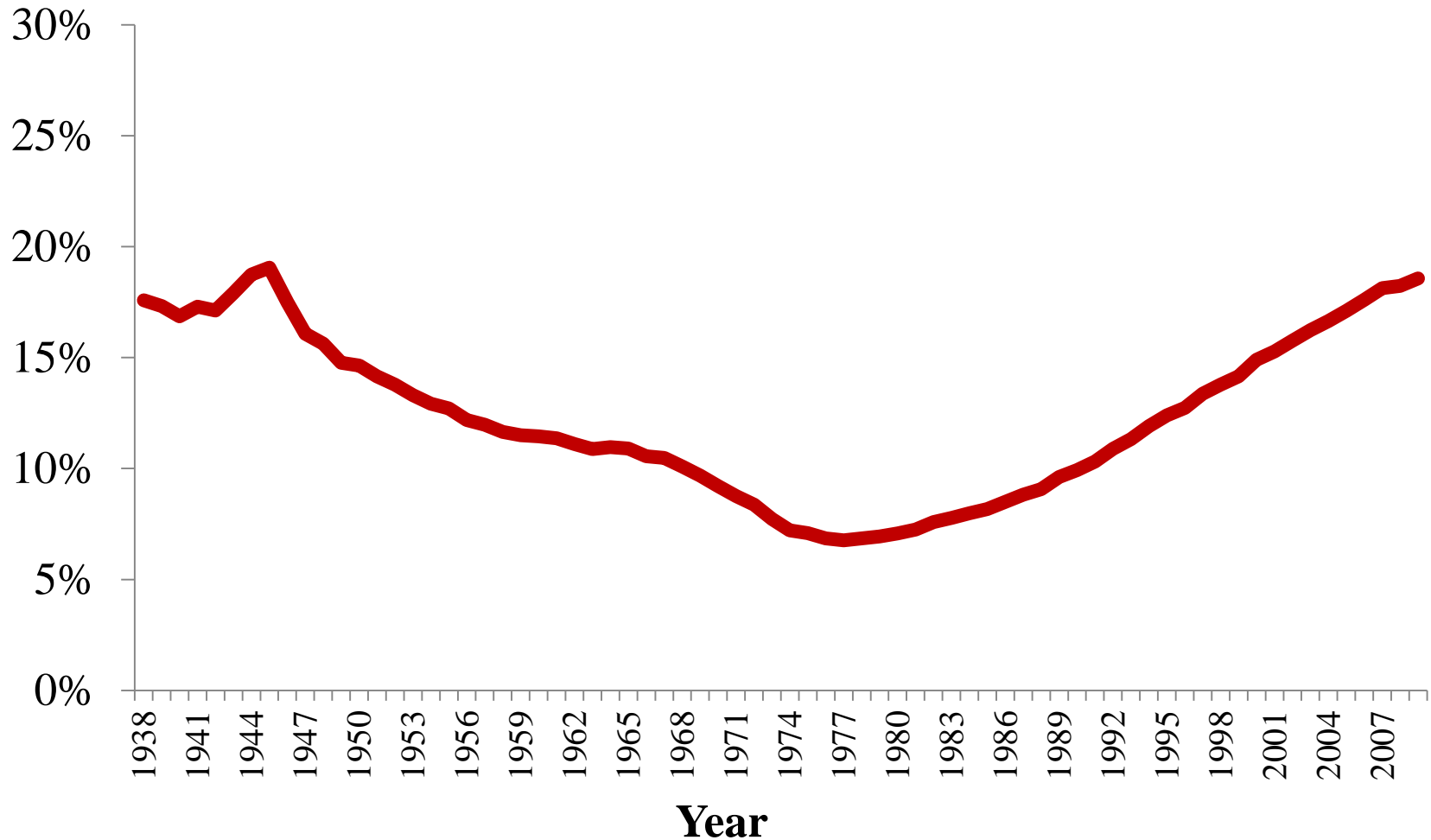
Alice Goisis

UCL

Postponement of childbearing

- Childbearing postponement has been increasing across high-income countries since the 1970s/1980s
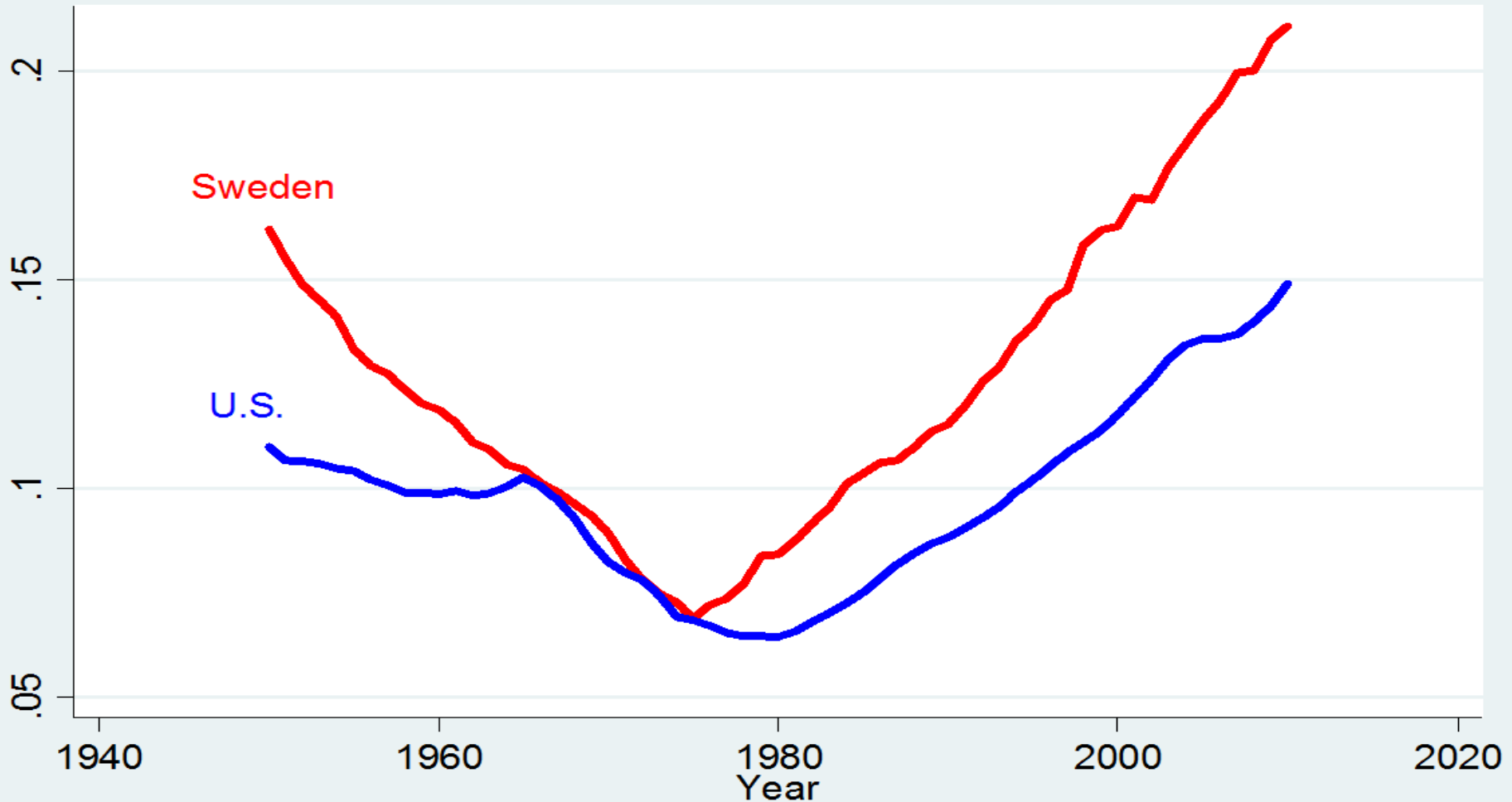
Maternal age at birth is increasing

Fraction of fertility attributable to mothers aged 35+: England & Wales

Source: Human Fertility Database

Maternal age at birth is increasing

Fraction of fertility attributable to mothers aged 35+: U.S. and Sweden

Postponement of childbearing

- Since the 1970s, in high income countries increasingly often women delay childbearing to older ages

- Increasing concerns about the consequences of being born to an older mother

  - According to the mainstream medical literature being born to an older parent may represent a significant **health risk**

Advanced maternal age a major risk factor

- For pregnancy and birth outcomes (e.g. Bewley et al. 2005 BMJ)
  - "Parental age has been shown to be a major factor, if not the most important factor, in producing variability in offspring" (Liu et al., 2011)
  - "The consensus is that increasing maternal age is independently associated with specific adverse pregnancy outcomes" (Nwandison and Bewley, 2006)

But..

- The magnitude of the association depends on the studies and controls used
  - Some studies suggest that the association might be confounded by maternal characteristics

How old is too old?

Health and medical concerns about childbearing at older ages

vs.

Contemporary older mothers advantaged characteristics (more than) compensate for the health complications

"The optimal age for childbearing, in terms of pregnancy outcomes, remains the age range 20-35" (Bewley, Davies & Braude,2005)

"The older mother today is at significantly lower risk [of poor health outcomes] than her contemporary two decades ago" (Carolan, 2003)

Childbearing at older ages over time in the UK
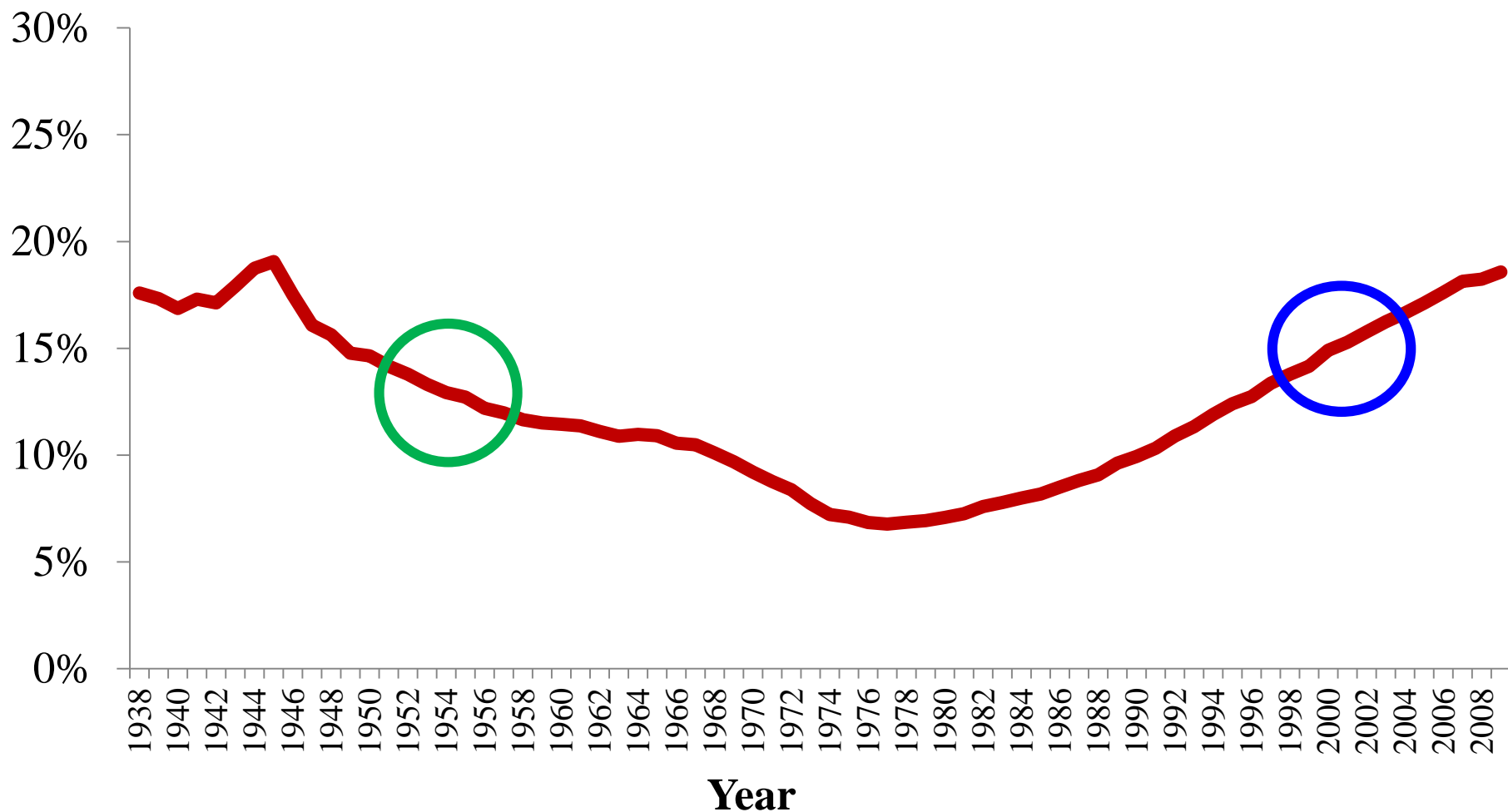
Source: Human Fertility Database

Childbearing at older maternal ages: past vs. present

- Currently, advanced age at birth positively associated with socio-economic status and behaviours
- In the past: a qualitatively different process
  - Strongly associated with higher order births
  - Socioeconomic incentives less clear
  - Different social norms regulating entry into parenthood
  - Lower quality antenatal/postnatal care and prenatal screenings

Study contribution

- **Nature of childbearing at older ages likely to have changed over time**
  - Limited evidence on how the profiles of older mothers have changed over time
  - No evidence on how the association between maternal age and child well-being has (as a consequence) changed over time

Research questions

- Have the profiles of older mothers changed over time?

- Has the association between maternal age and child well-being changed over time?

Cross-cohort comparison using UK birth cohorts

Data & Method

Survey	1958 (NCDS)	1970 (BCS)	2001 (MCS)
Representation	England, Scotland, Wales	England, Scotland, Wales	England, Scotland, Wales, Northern Ireland
Sampling	Babies born in a single week of March 1958	Babies born one week in April 1970	Babies born between Sept 2000 and Jan 2002
Baseline sample	17,416	17,287	19,244
Analytical sample	15,952	16,432	17,484

Data & Method

Main variables

- **Dependent variable – child health**
  - LBW (birth weight less than 2.5 kg)
- **Maternal age at cohort member birth**
  <20; 20-24; 25-29; 30-34; 35-39; **40+**

Analytical sample

- Live births
- Exclude babies weighting 4.5 kg+

Method

- Describe the profiles of mothers by age at first birth
- Logistic models to inspect the bivariate association between maternal age and LBW
- Adjust for family/mothers' SES, health and health behaviours

	1958 (NCDS)	1970 (BCS)	2001 (MCS)
Socio-demographic control variables			
Birth order	✓	✓	✓
Social Class	✓	✓	✓
Education	✓	✓	✓
Partnership at the time of birth	✓	✓	✓
Household income			✓
Overcrowding			✓
House ownership			✓

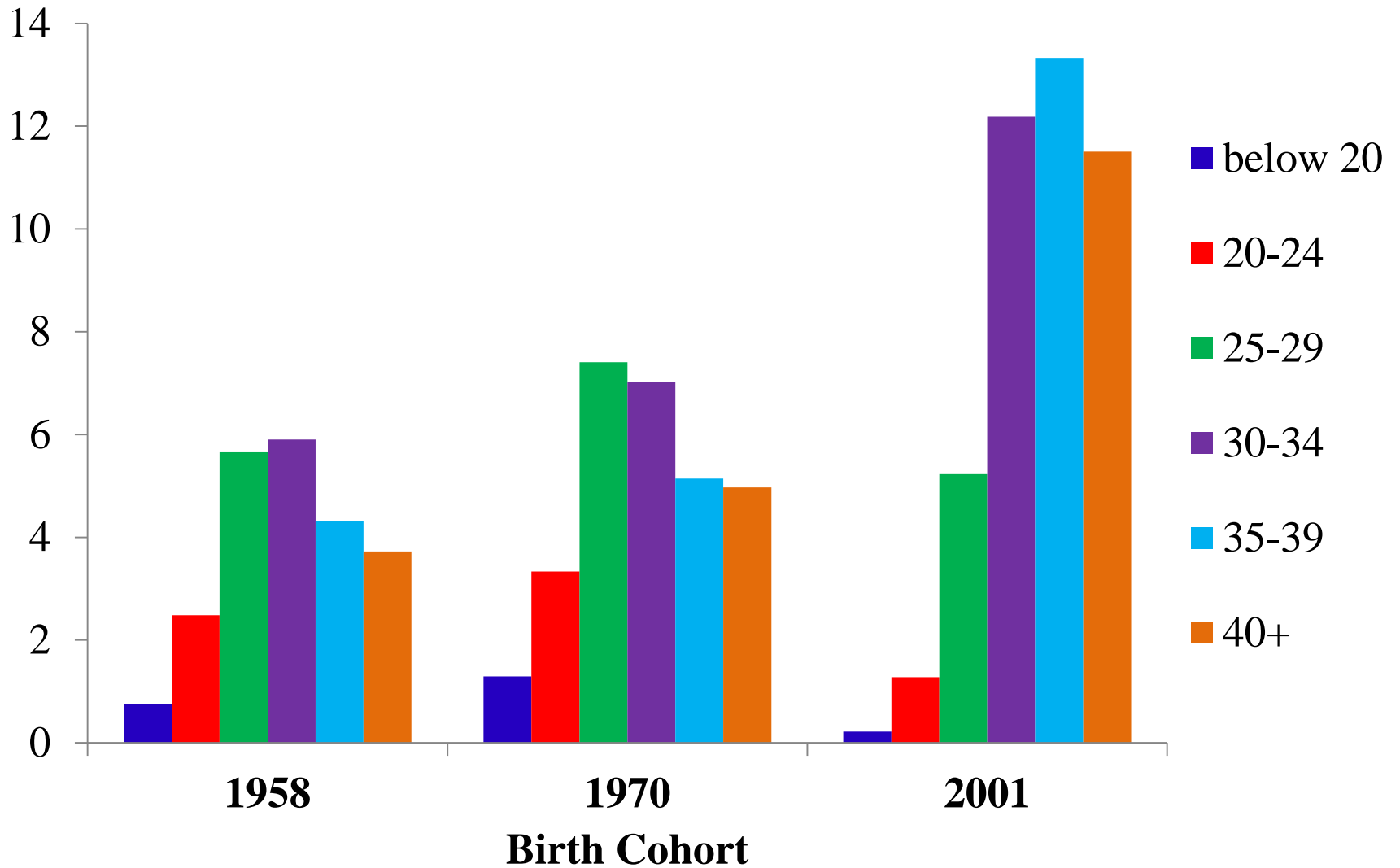|	1958 (NCDS)	1970 (BCS)	2001 (MCS)
Health and health behaviors			
Previous stillbirths/miscarriages	✓	✓	✓
Smoking during pregnancy	✓	✓	✓
C-section delivery	✓	✓	✓
Drinking during pregnancy			✓
Antenatal care after 12 weeks of pregnancy	✓	✓	✓
Gestational hypertension			✓
Mother's height	✓	✓	✓
Complications during labour	✓	✓	
Complications during pregnancy			✓

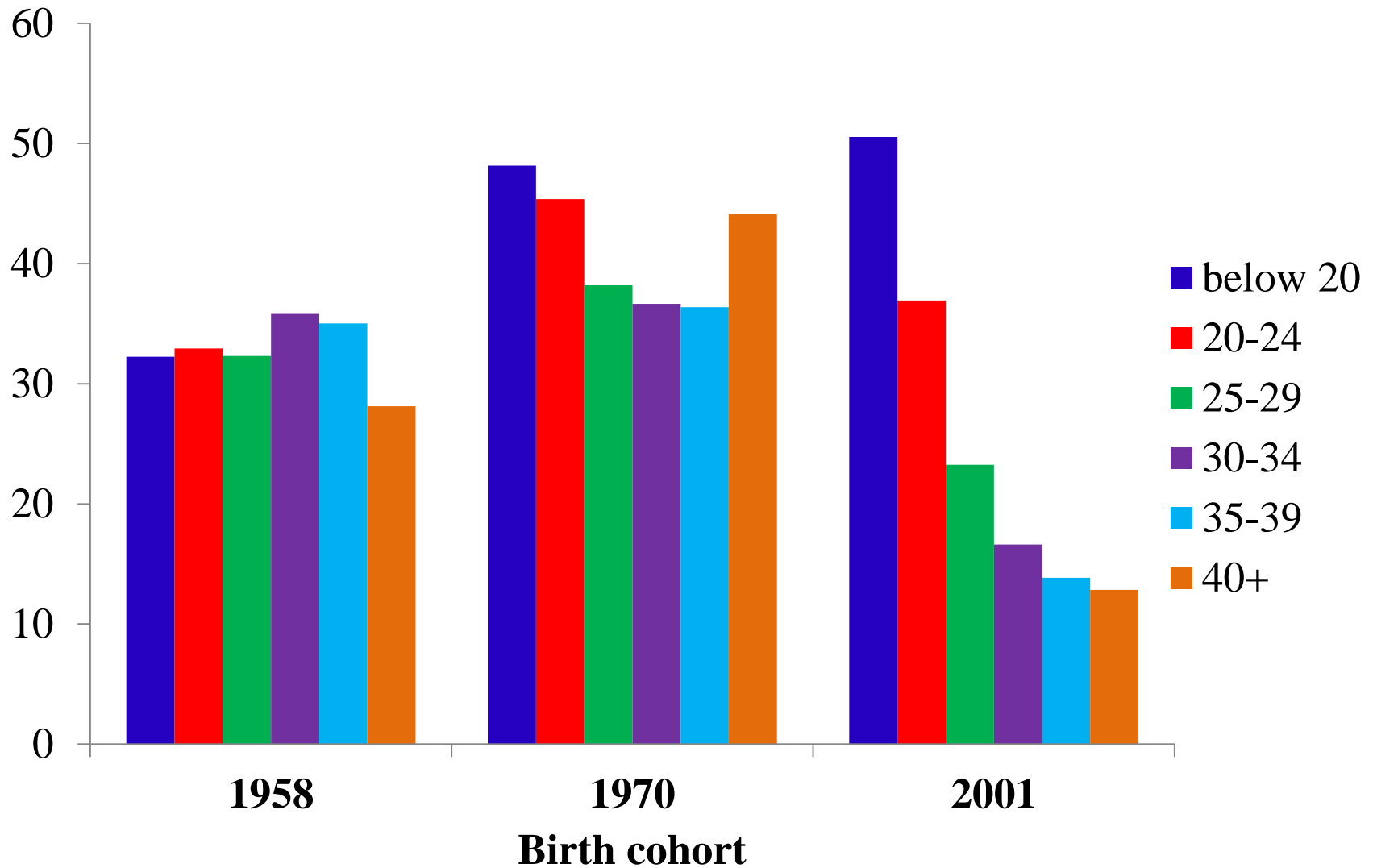# Have the profiles of older mothers changed over time?
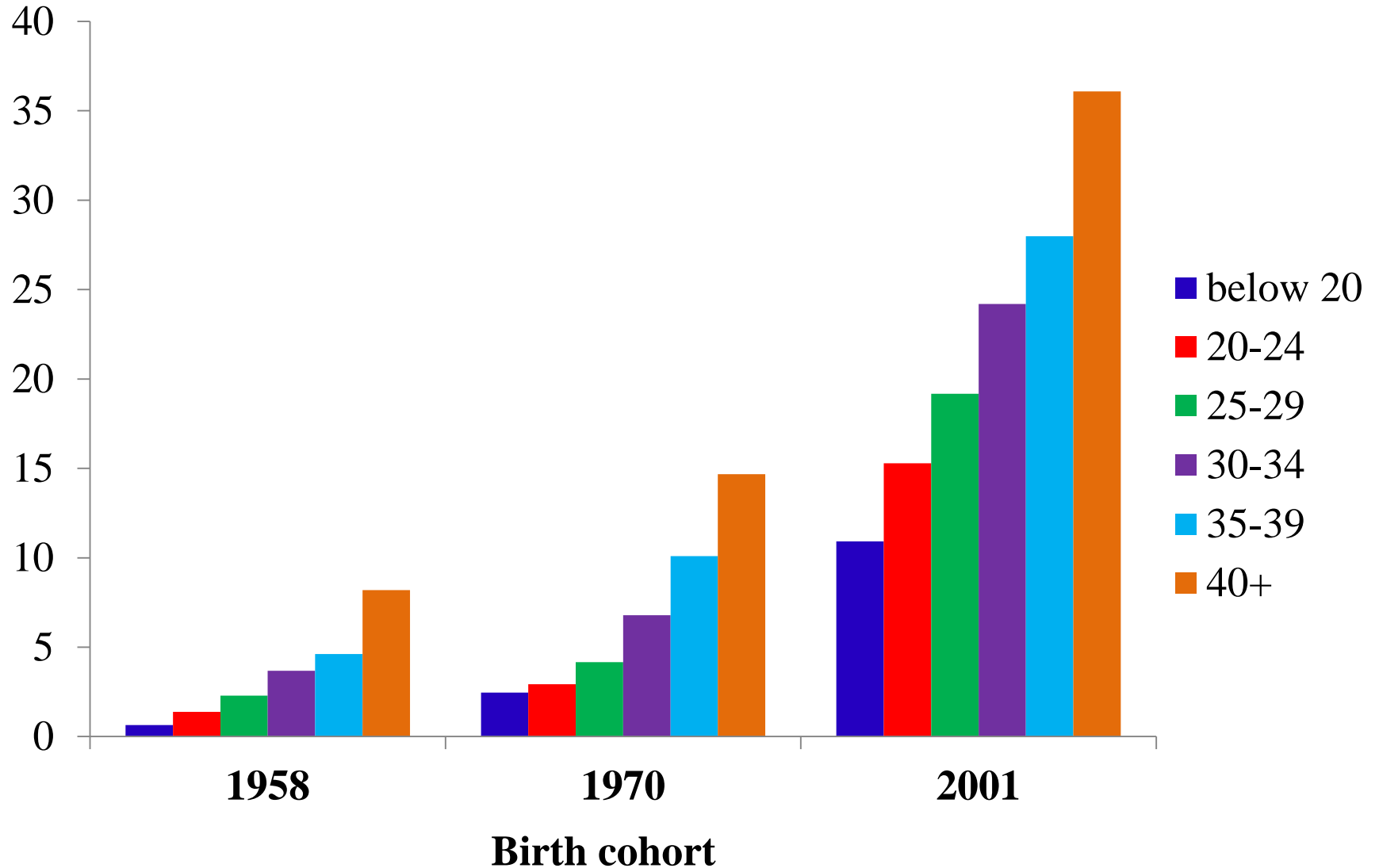
% births by maternal age
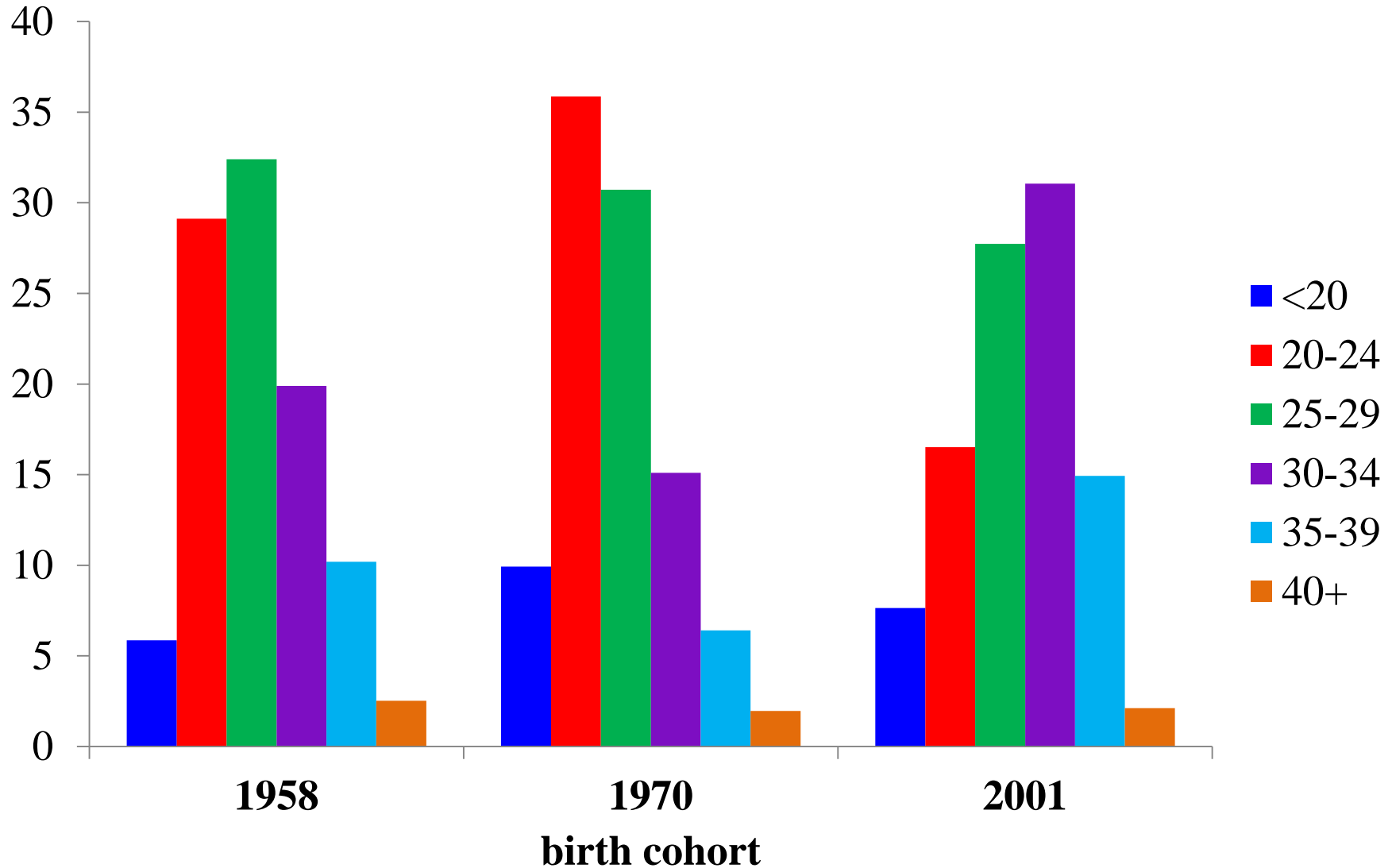
% first births by maternal age

% High Social Class

Birth Cohort

Legend:
- below 20
- 20-24
- 25-29
- 30-34
- 35-39
- 40+

% smoking during pregnancy

Legend:
- below 20
- 20-24
- 25-29
- 30-34
- 35-39
- 40+

Y-axis: 0, 10, 20, 30, 40, 50, 60

X-axis (Birth cohort): 1958, 1970, 2001

% C-section deliveries

Legend:
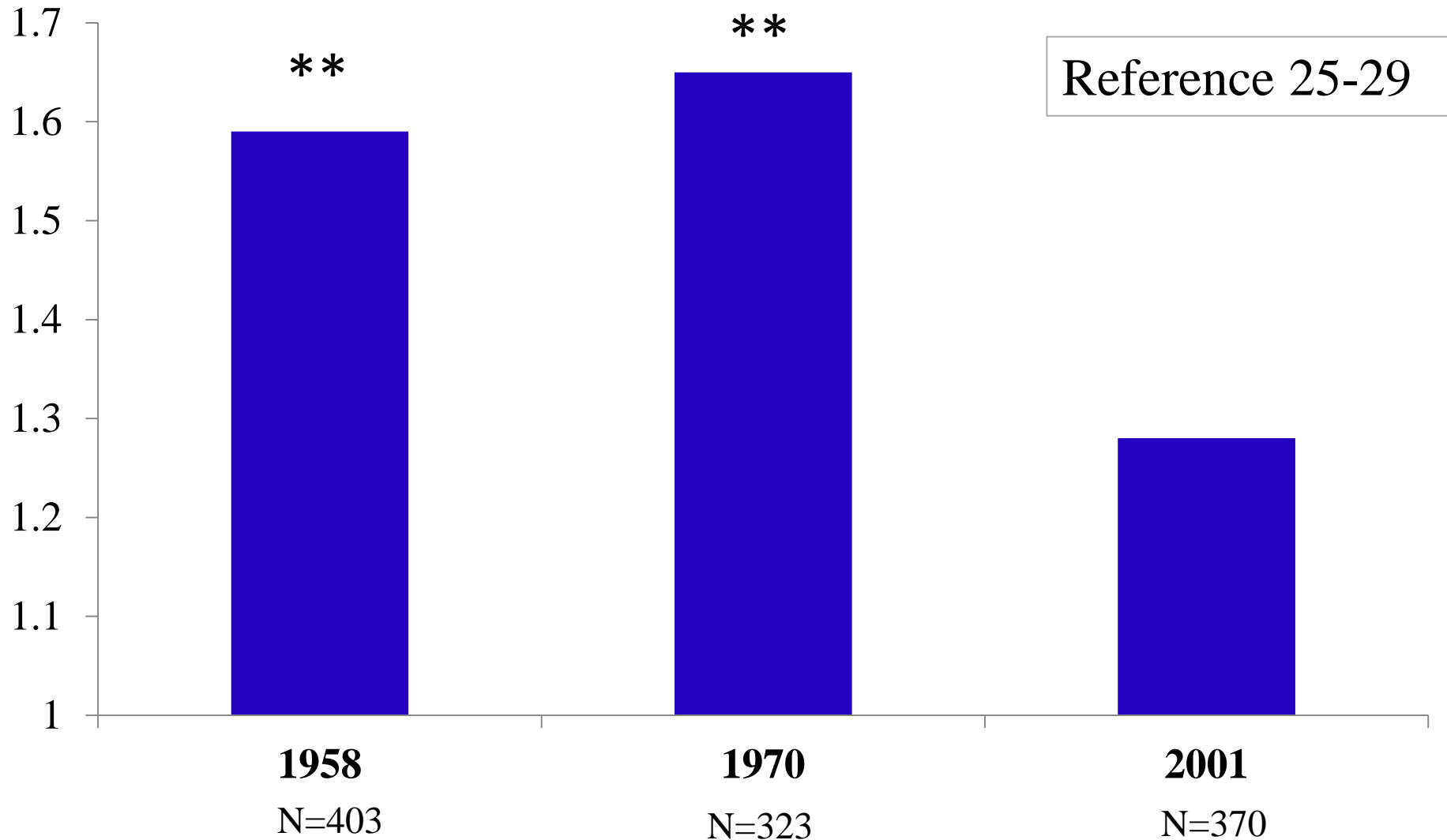- below 20
- 20-24
- 25-29
- 30-34
- 35-39
- 40+

Birth cohort: 1958, 1970, 2001

Has the association between maternal age and child health changed over time?

# Logistic regression model on LBW
Odds Ratios 40+ baseline model

Reference 25-29

1958 N=403

1970 N=323

2001 N=370

Logistic regression model on LBW

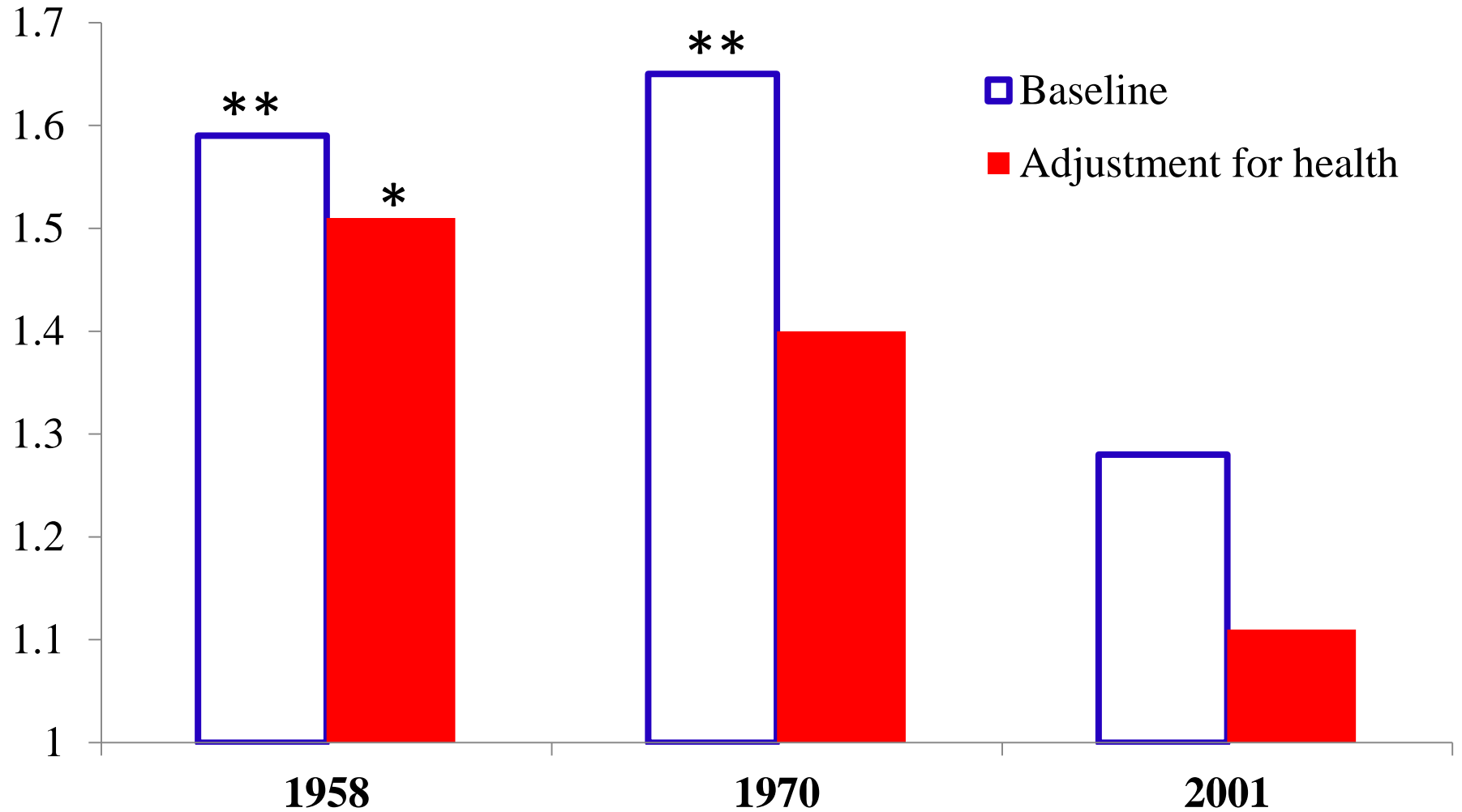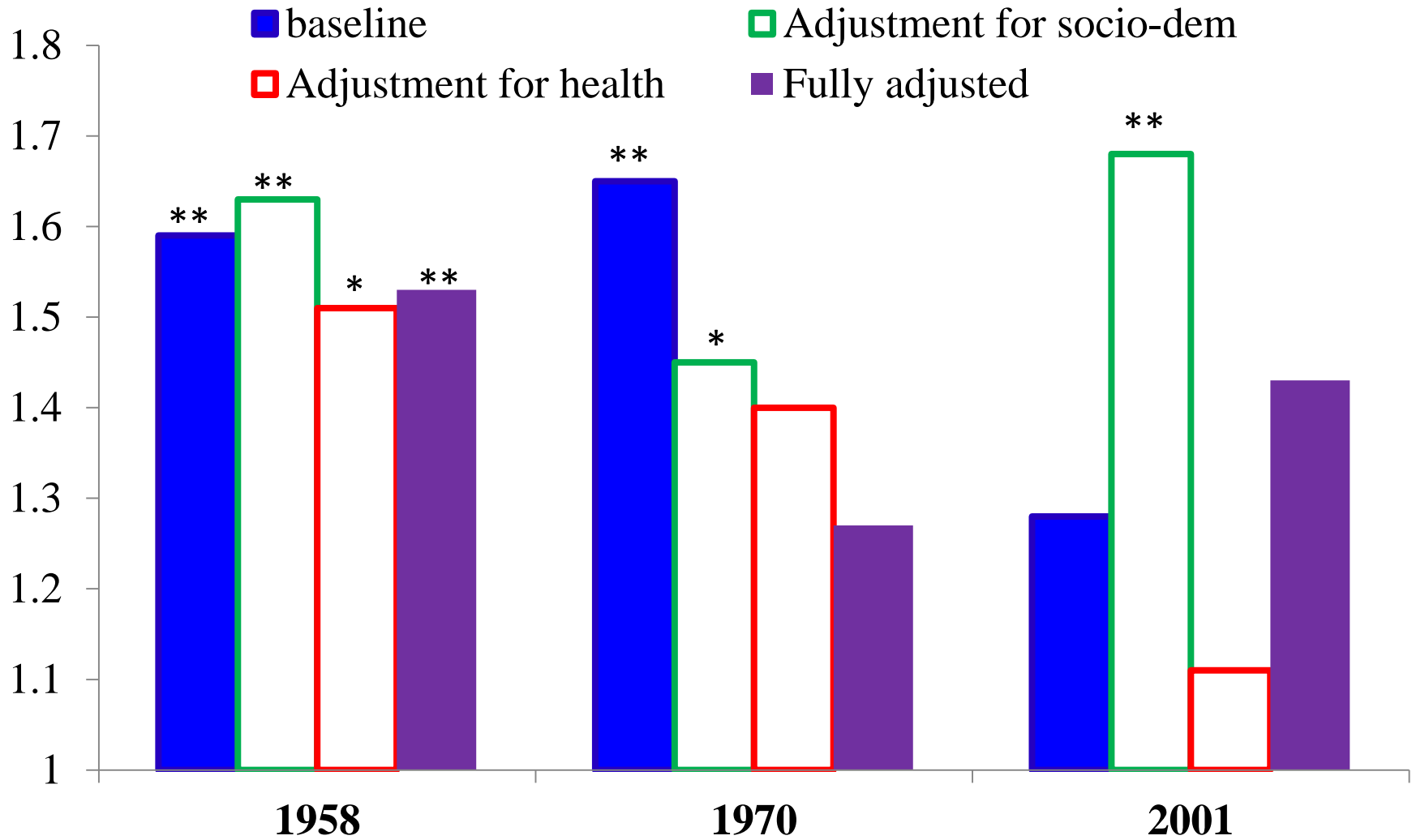|	1958	1970	2001
Maternal Age <20 (reference *25-29*)	1.60***	1.89***	1.36**
Maternal Age 20-24	1.11	1.35***	1.25*
Maternal Age 30-34	1.07	1.04	0.92
Maternal Age 35-39	1.13	1.11	0.96
Maternal Age 40 and over	1.59**	1.65**	1.28
Number of observations	15,952	16,432	17,484

OR 40+
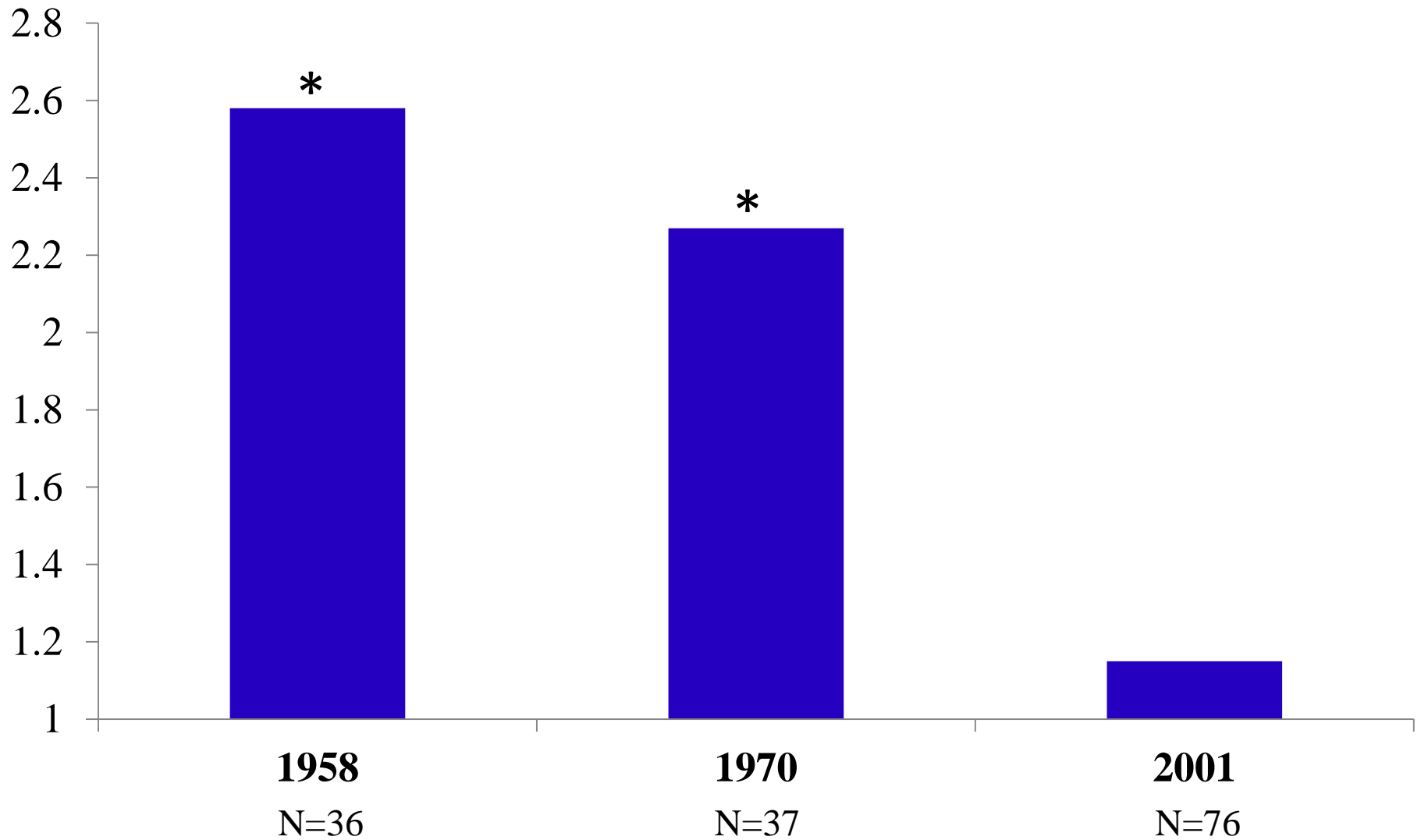## Adjustment for socio-demographic factors
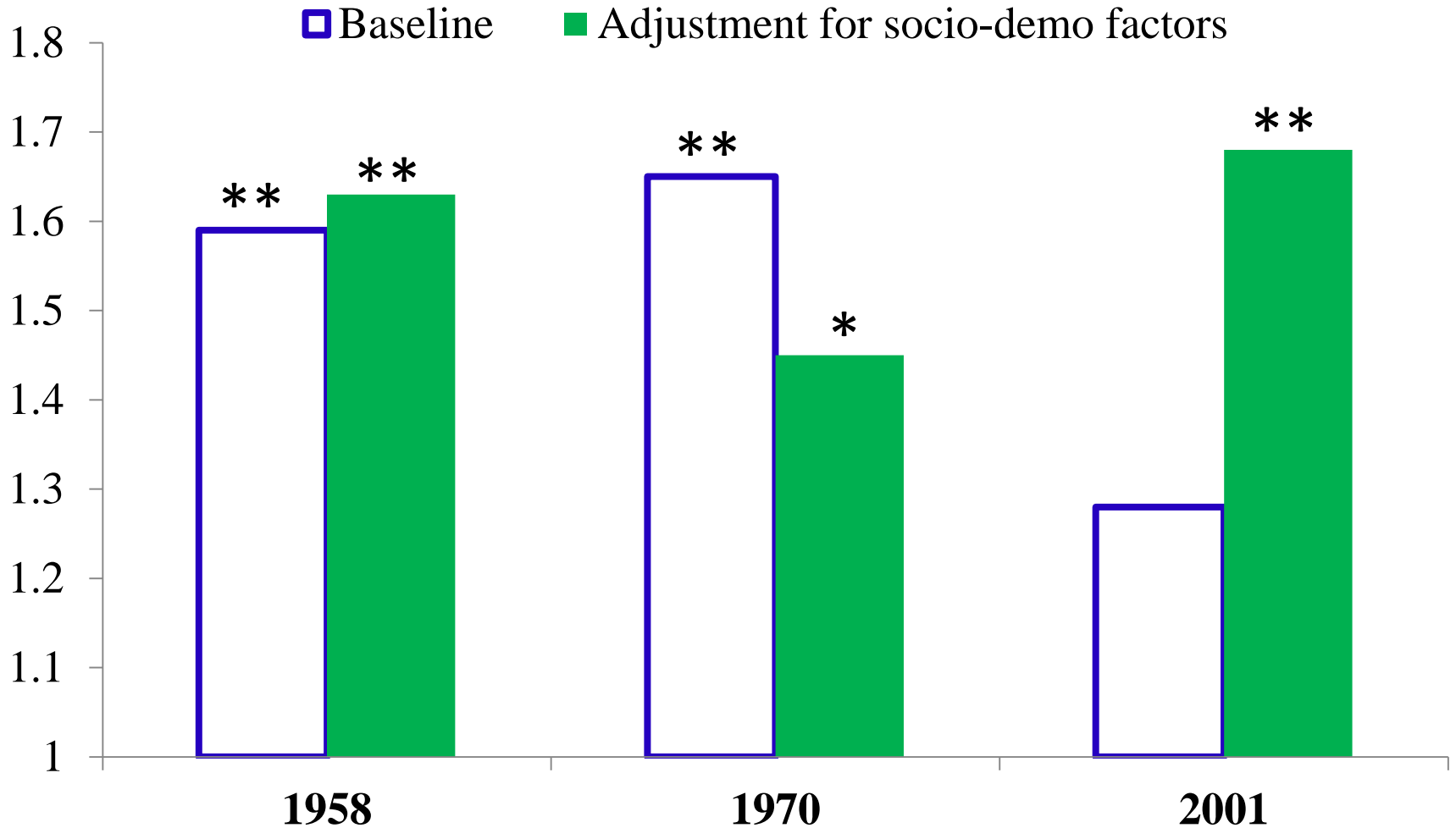
OR 40+
Adjustment for health

OR 40+
Fully adjusted

Has the association between maternal age and cognitive ability in childhood changed over time?

Data & Method

Dependent variable

- **Cognitive ability**
  - Verbal test
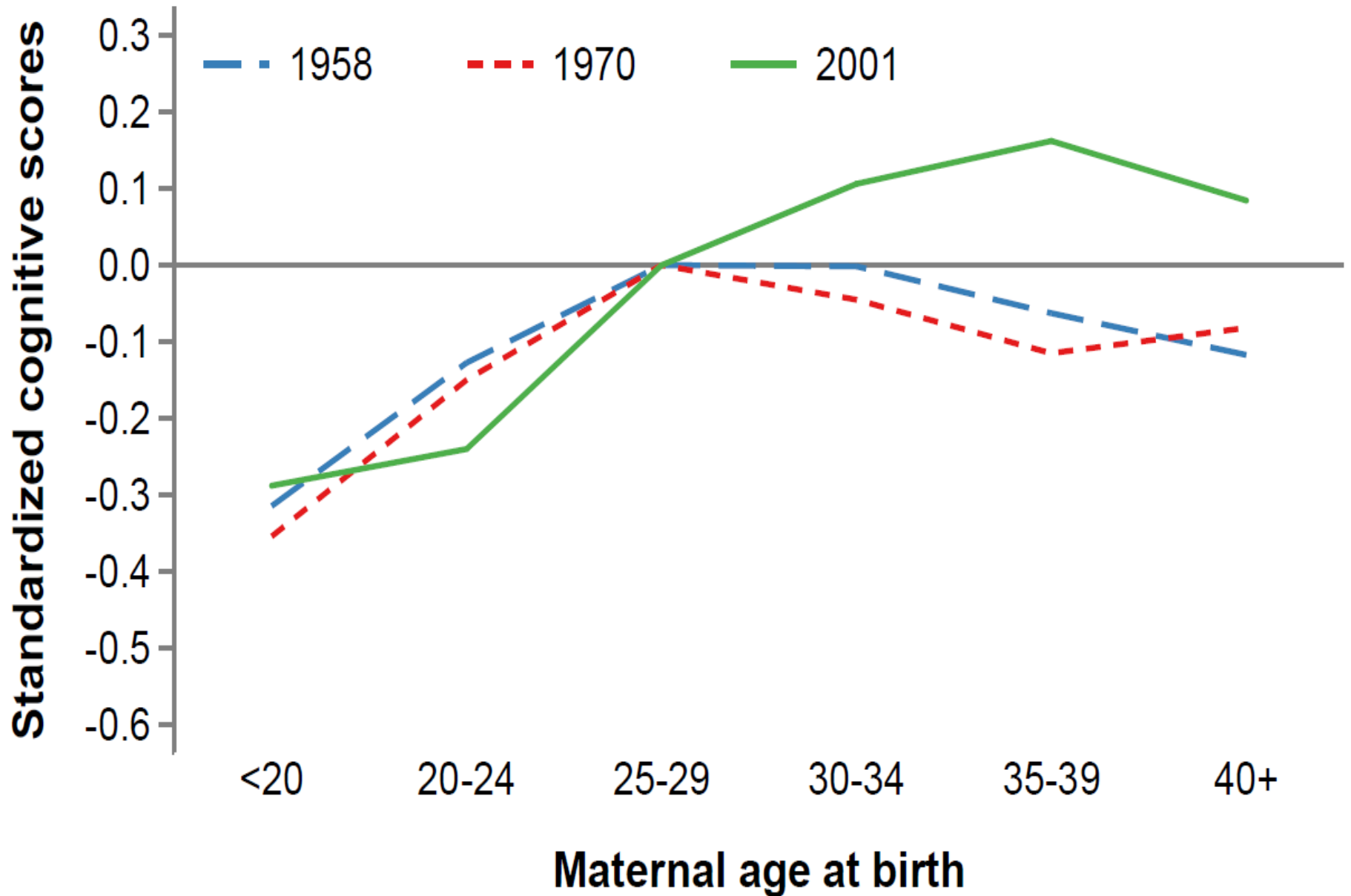 - At age 11 (1958/2001) or 10 (1970)
  - Standardized

Maternal age

- **Maternal age at cohort member birth**
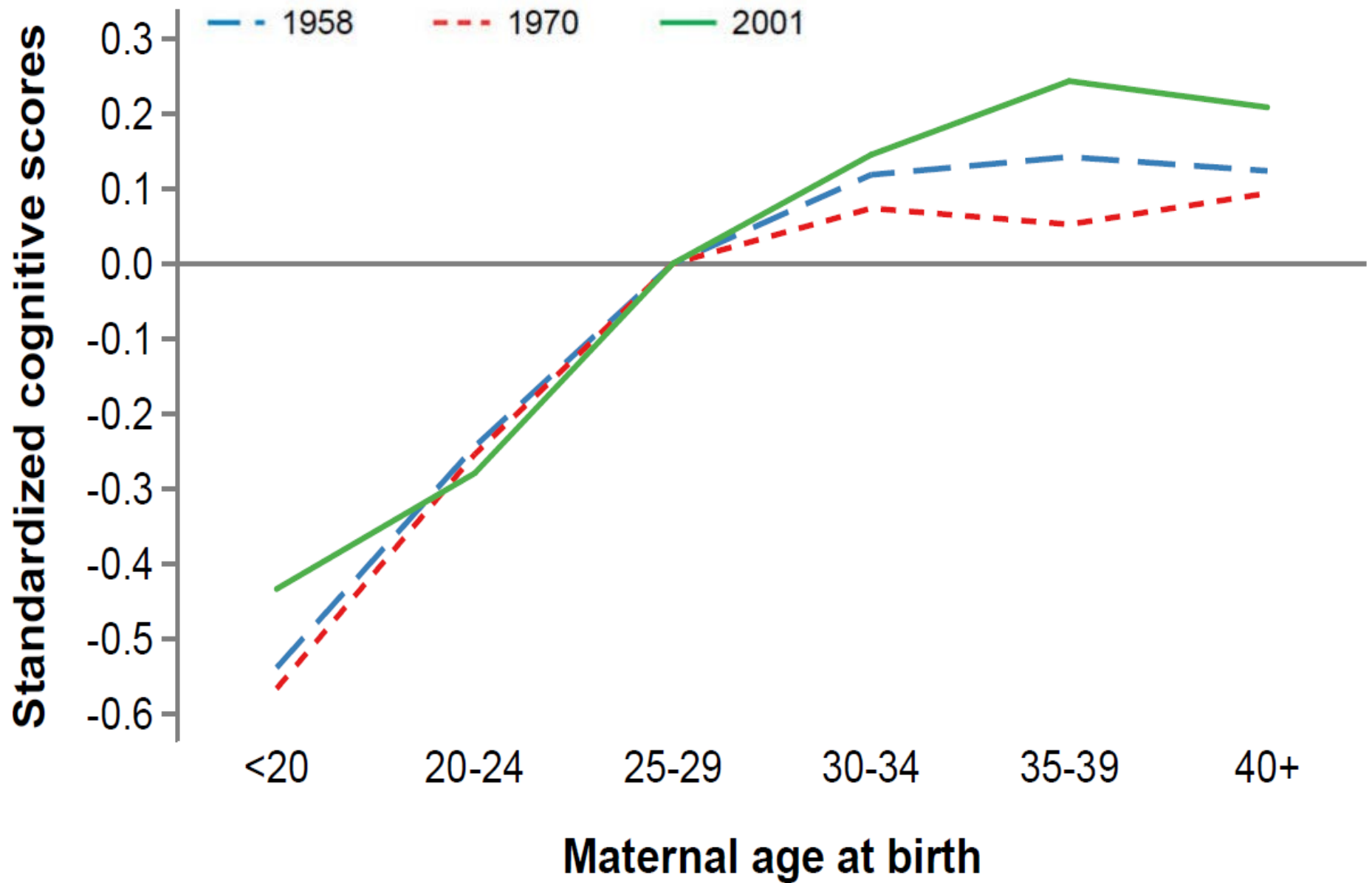
  <20; 20-24; 25-29; 30-34; **35-39; 40+**

Method

- Linear models
  - Model 1: unadjusted association (twin, girl)
  - Model 2: birth order
  - Model 3: birth order + parents' socio-demographic characteristics

Model 1: baseline model

Standardized cognitive scores (y-axis) vs Maternal age at birth (x-axis: <20, 20-24, 25-29, 30-34, 35-39, 40+)

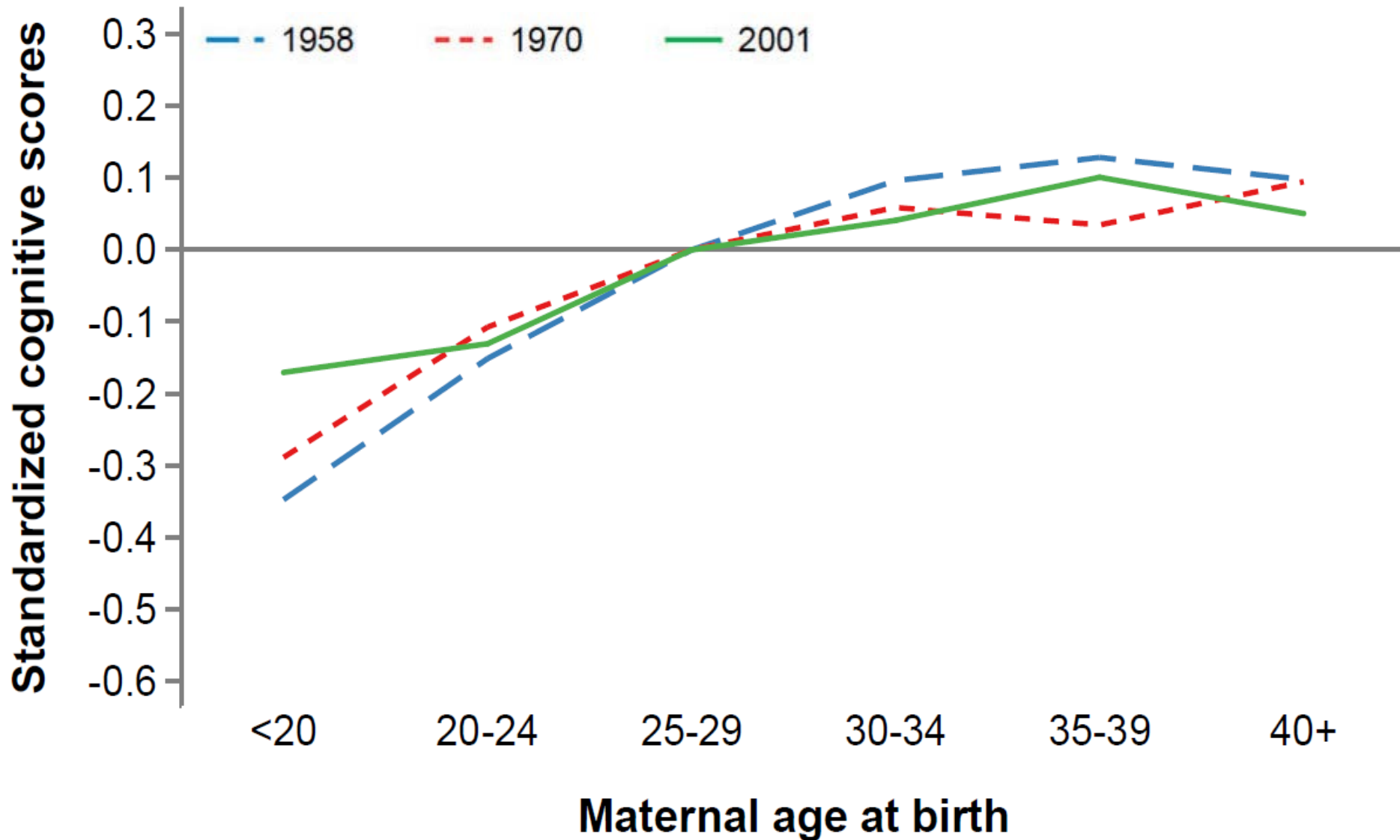Legend: 1958 (blue dashed), 1970 (red dotted), 2001 (green solid)

Model 2: adjusted for birth order

Model 3: Adjusted for birth order and parents' socio-demographic characteristics

Testing for differences across cohorts

Maternal age 35-39	1970 to 1958	2001 to 1958	2001 to 1970
Model 1: Baseline	-0.052	0.225 ***	0.277 ***
Model 3: birth order + socio-demographic characteristics	-0.094	-0.028	0.066

Limitations

- Small sample size

- Live births only

- How much is due to changes in context?

Summary

- The association between advanced maternal age and child well-being has changed over time

- The results suggest this occurs because the association between maternal age and socio-demographic processes has changed over time

Summary

- Older mothers in a contemporary cohort are relatively more **advantaged** socioeconomically than in older cohorts

- Across cohorts older maternal age **less** likely to be associated with poor child health and **more** likely to be associated with better cognitive scores

- The socio-demographic disadvantage that historically was associated with older maternal age has not only **disappeared**, but has turned into a potentially important **advantage**

Overall conclusions

- Maternal age is a complex variable which reflects a multitude of social and health processes

- The intersection of these processes might vary over time and result in heterogeneous associations between maternal age and well-being

- Question its meaning and consequences and contextualize

Research supported by the COSTPOST project (PI Mikko Myrskylä)

- **Goisis, Alice** and Schneider, Daniel C. and Myrskylä, Mikko (2017) The reversing association between advanced maternal age and child cognitive ability: evidence from three UK birth cohorts. *International Journal of Epidemiology*

- **Goisis, Alice** and Schneider, Daniel and Myrskylä, Mikko (2018) Secular changes in the association between advanced maternal age and the risk of low birth weight: a cross-cohort comparison in the UK. *Population Studies*

Thank you!

a.goisis@ucl.ac.uk

% LBW

1958	1970	2001
5.3	6.8	6.7